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ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE,

FOR

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ALEXANDER AGASSIZ, *Curator.*
JOSIAH D. WHITNEY, *Secretary.*
GEORGE L. GOODALE.
HENRY P. BOWDITCH.

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JOSIAH D. WHITNEY	*Sturgis-Hooper Professor of Geology.*
HERMANN A. HAGEN	*Professor of Entomology.*
NATHANIEL S. SHALER	*Professor of Palæontology.*
E. L. MARK	*Hersey Professor of Anatomy.*
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J. ELIOT WOLFF	*Instructor in Petrography.*
THADDEUS W. HARRIS	*Instructor in Geology.*
G. HOWARD PARKER	*Instructor in Zoölogy.*
WALTER FAXON	*Assistant in Zoölogy.*
D. D. SLADE	*Assistant in Osteology.*
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W. M. WOODWORTH	*Assistant in the Zoölogical Laboratory.*
W. E. RITTER	*Assistant in the Zoölogical Laboratory.*
R. S. TARR	*Assistant in the Geological Laboratory.*
R. DeC. Ward	*Assistant in the Geographical Laboratory.*
MISS F. M. SLACK	*Librarian.*

REPORT.

To the President and Fellows of Harvard College: —

During the past year the usual courses of instruction have been given at the Museum in Zoölogy by Professor Mark and Mr. Parker, assisted by Mr. C. B. Davenport in the Laboratory work. Dr. Slade has given a course in Osteology.

Professor Farlow, assisted by Mr. W. A. Setchell, has given the botanical part of the introductory course of Natural History. Professors Whitney, Shaler, and Davis, and Dr. J. E. Wolff gave the usual courses in Geology, Palæontology, Physical Geography, and Petrography. Messrs. Harris and Cobb were the Assistants in the Undergraduate instruction of the Geological Department.

For the details of these courses of instruction, as well as of the summer courses in Geology, I would refer to the accompanying special reports of the Professors and Instructors.

The Assistants of the Museum, Professors Hagen and Faxon, Dr. Slade, Messrs. Garman and Brewster, and Professor Hyatt, have devoted a good share of their time in supplying specialists with material and information in their various departments.

The Geological Section of the Museum, containing the Exhibition Rooms and additional Laboratories of that department, is now ready for occupancy. On the first floor, it contains a large lecture-room, with a seating capacity of 320 students. On the second floor are placed the Petrographical Laboratories, — one for general use, the other for advanced students. In the basement are found a Chemical Laboratory, a room for grinding rocks, and a photographic room. The fourth floor is occupied by the two Laboratories of the Physical Geography Department, with a room for modelling in the basement. On the third floor, the two Exhibition Rooms assigned to the Geological and Geographical Collections connect the Exhibition Rooms of the Museum of Comparative Zoölogy with these of the Botanical and Mineralogical Departments. These, in their turn, will eventually open into the Exhibition Rooms of the southwest corner piece adjoining those of the Peabody Museum.

I have annexed to this Report a view of the University Museum, as seen facing the northwest corner, including the newly erected Mineralogical Sections.

Messrs. W. M. Woodworth, W. Whitney, and G. H. Parker availed themselves of the facilities offered by the United States Fish Commission Station at Wood's Holl, for which the Museum is specially indebted to Colonel McDonald, U. S. Fish Commissioner. These gentlemen, as well as Messrs. C. B. Davenport, W. E. Ritter, and Professor Mark, spent some time at the Newport Marine Laboratory, either collecting material for future investigation, or carrying on special work in the embryology of Bryozoa, Annelids, Crustacea, Echinoderms, and Polyps. Mr. Woodworth spent a few days at the opening of the season in putting the Newport Laboratory in order for the reception of students.

The Museum has been fortunate enough to secure a fine skeleton of a Sperm Whale, about fifty feet in length. It was obtained through the kindness of Consul Dabney of Fayal, and is now in the hands of Professor Ward for mounting.

We have continued to make a few purchases, mainly to fill gaps in our Exhibition Rooms. Skins of some of the larger Selachians and Fishes have been mounted by Ward for the Atlantic and Pacific Exhibition Rooms. A fine Sea Elephant has been placed in the Atlantic Room. Otherwise, few changes have taken place in the Exhibition Rooms. The collections open to the public remain in a satisfactory condition, in spite of the constantly increasing number of visitors, and the crowded condition of the rooms on holidays and Sundays.

The Museum is again indebted to Messrs. Brewster and Cabot, Professor Faxon, and Dr. Slade, for the interest they have taken in their respective departments, and for the care they have given to the collections in their charge.

Material has been sent for study to Dr. Paul Meyer of Naples, to Professor Goette of Strasburg, to Baron Selys-Longchamps, and to Dr. Richard Semon. The Marquis of Doria has kindly undertaken a revision of our collection of Bats. Exchanges have been made with the Museum of the Academy of Sciences of St. Petersburg, through Prof. A. Strauch; the Museo Civico of Milan, through M. Belloti; the Jardin des Plantes, through Prof. L. Vaillant; the K. K. Hofnaturalien Cabinet (Dr. F. Steindachner); the British Museum (Dr. A. Günther); the University Museum of Christiana (Professor Collet); the University Museum of Berlin (Professor Möbius); Professor Ehlers of Göttingen; Professor Lütken of the University Museum of Copenhagen; Dr. E. Ramsay of the Australian Museum of New South Wales at Sidney; C. W. De Vis of the Queensland Museum at Brisbane; and with the National Museum at Washington. A few minor exchanges are also mentioned in the special reports of the Museum Assistants.

Of the Blake Collections, those in the hands of Professor Verrill have not yet been returned. Professor Perrier and Professor Milne-Edwards have retained a part of the Blake Collections, while working up the collections of the "Talisman." Dr. P. H. Carpenter has continued his work on the Report of the "Blake" Comatulæ; the proofs of several of the plates to accompany his Report have been received.

Professor Huxley has returned the Spirula dredged by the "Blake" off Grenada, which was sent him for comparison while writing his Monograph on the species of Spirulæ collected by the "Challenger."

Messrs. Scott and Osborn have returned the larger part of the second and third instalments of the Western Vertebrates sent them for study. This material has greatly increased in value, not only from the work they have done upon it in the way of cleaning and repairing the specimens, but also from the careful study they have bestowed upon the part of the collections of Western fossils which have been placed in their hands. They have sent the manuscript and drawings for a second Bulletin on the Fossil Mammals from the White River and Loup Fork Formations, which is now in press.

A number of exceptionally fine or interesting Crinoids have been sent to Messrs. Wachsmuth and Springer for study, to assist them in the preparation of their magnificent Monograph of the Palæozoic Crinoids. The Curator of the Museum has always felt special interest in this monograph; it owes its origin to the work of Mr. Wachsmuth, based upon his original collection now in the Museum. On the death of Professor Agassiz, when Mr. Wachsmuth left Cambridge, he started a new collection, and, with the assistance of his devoted and indefatigable collaborator, has brought together a second collection, unique in its way, which has become well known to palæontologists from the "Revision of the Palæocrinoids." It is hoped that some arrangement may be made by which the publication of this monograph, so much of which is based upon the work of Mr. Wachsmuth on the collection now in Cambridge, may eventually appear in the Memoirs of the Museum.

It will be seen from the special Reports of the Assistants, that the collections of the Museum continue in good condition, and that the Assistants not only have been active in the increase and care of the collections in their charge, but have been able to devote considerable time to original work, as shown by the lists of the publications of each Department accompanying the special Reports.

Appendix A of this Report contains a list of the publications of the Museum issued during the past academic year.

We have published twelve numbers of the Bulletin, four in the Geological, and eight in the Zoölogical Series. One number of the Memoirs, "The Genesis of the Arietidæ," by Professor Hyatt, has been published jointly with the Smithsonian Institution. This important memoir has been in preparation by Professor Hyatt for a number of years, and is an important contribution to the palæontological history of the Cephalopods.

A number of Bulletins are in preparation, representing the work of the students of the Zoölogical Laboratory in charge of Professor Mark.

Mr. Louis Cabot is preparing the final part of his Memoir on the Immature State of the Odonata.

Mr. Garman is preparing for the press a monograph on the Liparidæ, commenced several years ago by Professor Putnam. He has also nearly completed an account of the North American Reptiles. The second part of the Memoir on the Development of Osseous Fishes, by Professor Whitman and myself, is nearly completed, and I have made good progress in the preparation of my Monograph on Calamocrinus, of which twenty plates have been completed.

The accessions to the Library show a decided increase in number even over the past year, which had shown the greatest accessions thus far received.

Special efforts having been made to interest the Visiting Committees of the Overseers in the affairs of the different departments of the University, I herewith add the Report which was prepared for the Committee on the University Museum.

"When Professor Goodale succeeded in obtaining the necessary funds for an extension of the University Museum in order to accommodate the Botanical Department, it became necessary that the Museum of Comparative Zoölogy should obtain means for building a section to connect the Natural History Laboratories with the Botanical Section.

"All attempts to obtain this from outside sources having failed, the Curator applied to the Corporation to advance the funds needed for the building and its equipment, so as to make it available for the Petrographical, Geographical, and Geological Departments. This the Corporation has done, and, as on former occasions, these advances, amounting to about $25,000, will have to be repaid from the income of the Museum. This will naturally cripple our resources for six or seven years, unless the sum can be provided for the Museum by the friends of the Geological Department. The Geological Section, now finished, completes the plan of the Laboratories for the Zoölogical, Geological, and Geographical Departments, and we are now well provided with Laboratories, though their equipment still leaves a good deal to be desired, as also in the way of models for the Geographical and Geological Departments, and in the fitting up of the Vivarium and Aquarium for the Zoölogical Department. For these objects an additional $8,000 is required. Ample room is now provided for the exhibition of everything that is likely to interest the public, and this space need never be enlarged, while the efficiency of the exhibit can always be improved by culling out poor specimens and replacing them by better or more interesting types. Of course the University may, in the course of time, outgrow the Laboratories, but there is ample room for their expansion in the corner piece which is eventually to connect the main building of the University Museum with the Peabody Museum, forming the South Wing of the structure.

"There is, however, one point in the organization of the Museum to which I should like to call attention. Nearly two thirds of the North Wing, the part of our structure called the Museum of Comparative Zoölogy, is devoted to the storage of our collections intended for study and not for exhibition. I can safely say that there is no Museum in which the system of storage of both dry and alcoholic specimens is so convenient for access as that of the Museum collection. Special rooms are devoted to special subjects, and they are so arranged that a number of specialists could work at the same time on any part of the collections without inconvenience. For the alcoholic collections two rooms, 80 by 40 feet, are reserved in the basement for such use. In the rooms containing the dry collection (both recent and fossil) the space adjoining the windows has been equipped with tables, so that a large space is everywhere left, ample for the needs of specialists interested in any part of our collection. This space is an equivalent of 8 by 40 feet in each of the nineteen rooms in which the collections are stored. It is this part of the Museum which I should like to make more available to students and specialists. But without a larger staff to oversee the rooms while they may be occupied, it is impossible to grant the unrestricted use of our collections to those who might avail themselves of the facilities we are able to give for study.

"The practice of sending collections to specialists for study is ruinous to the specimens; each invoice involves considerable work on the part of the Assistants, and the danger of misplacing labels during the packing and unpacking is very considerable. So that in the future we shall be obliged, on the ground of safety for our collections, to refuse to send specimens out of the building, and invite the specialists to avail themselves of our facilities on the spot. The staff of the Museum is somewhat crippled at present, there being no Assistant in charge of the Invertebrates. As this collection can, however, be otherwise cared for, it has been decided by the Museum Faculty not to fill this place until the Museum is out of debt. I would also call attention to the necessity of having a regular Assistant for the care of our Vertebrate Fossil Collections. These are already quite extensive, and the collections we are likely to receive in the future from the

West must of necessity be very large. But at present the Museum has no means to pay such an Assistant, nor have we the means to spend from $5,000 to $6,000 annually for a number of years in making explorations of Western territories in order to fill our gaps, both in the fossils of the various well known Western fossiliferous beds, and in the systematic series of fossils which are found there. The Assistant in charge of the collection of Skeletons of Mammals receives no remuneration from the Museum.

"The Museum publications are strictly limited to the work done in the Museum by the Professors and their Assistants, and the students of the various Laboratories, or to the work of specialists based upon the Museum collections.

"The arrangement of our Palæontological Rooms progresses very slowly, mainly for want of funds for the necessary cases. It would require about $20,000 to place on exhibition a suitable selection of our fossils."

Provision has been made by borrowing the needed funds from the Corporation for the greater part of the fossils for the Tertiary Rooms, which promise to be our most valuable and instructive Exhibition Rooms. The acquisition of a fine series of Pampas Mammals, obtained through the agency of Professor Henry A. Ward, including mountable skeletons of Mylodon, Glyptodon, Lestodon, Scelidotherium, and Toxodon, will necessitate a redistribution of the space assigned to the Tertiary Faunæ. In order to provide for the North American Tertiary Mammals, two rooms at least will be required, which can be advantageously filled with interesting and instructive specimens for exhibition, and the Mesozoic and Palæozoic Faunæ will each have to be limited to one room.

ALEXANDER AGASSIZ.

CAMBRIDGE, October 1, 1890.

REPORT ON THE GEOLOGICAL DEPARTMENT.

By Josiah D. Whitney, *Sturgis-Hooper Professor of Geology.*

During the year a course of lectures on Economical Geology was given. This course (twice a week, lasting through the College year) was attended by about twenty students, mostly Seniors and candidates for higher degrees.

The time of the Professor in this department, when not engaged in lecturing or preparing for lectures, has been mostly given to the continuation of the work on the Century Dictionary, which has now reached the end of the letter R, and will be completed as originally planned, and laid before the public, in about eight months.

The collections of rocks made by and under the direction of the Sturgis-Hooper Professor in former years have been removed to the new Palæontological Rooms and placed in charge of the Professor of Petrography. These collections embrace a wide field, principally representing the western side of North America, Mexico, and parts of Central America. There is also a fine representation of the rocks of San Domingo, the same being the collection made by Mr. W. M. Gabb during his survey of that region. There is also a large collection of rocks made by Mr. Diller, while connected with the Assos expedition. All the specimens are of good size and in perfect order. There are also about three thousand slides belonging to these specimens, made in former years at the expense of the Sturgis-Hooper Professor. A portion of these slides are still in possession of Mr. Wadsworth, formerly Instructor in Petrography in this institution. A report on the rocks to which these slides belong is still expected from Mr. Wadsworth, and he has recently promised to have the same in readiness by the year 1892.

A small amount of field-work has been done by the Sturgis-Hooper Professor in continuation of that carried on in previous years with reference to the surface geology and glacial phenomena of North America, and the general subject of climatic change.

REPORT

ON THE INSTRUCTION IN GEOLOGY, PALÆONTOLOGY, PHYSICAL GEOGRAPHY, AND PETROGRAPHY.

BY PROFESSORS N. S. SHALER AND W. M. DAVIS, AND DR. J. E. WOLFF.

DURING the Academic year 1889–90, the following courses of instruction were given in the Geological and Palæontological Laboratory, and in the field, by the instructors in the department.

1. N. H. 4. A course in Elementary Geology, by N. S. Shaler. Two lectures a week, with certain required reading; attended by one hundred and sixty students.
2. N. H. 4 *a*. A course of Practical Geological Exercises in the Laboratory and in the field, by Mr. T. W. Hartis, assisted by Mr. Collier Cobb, designed especially for those who intend in subsequent years to continue the study of Geology and Palæontology; attended by sixty-six students.
3. N. H. 8. A course of Advanced Geology, two lectures a week, by N. S. Shaler, together with assigned field-work, conducted by W. M. Davis and J. E. Wolff. Students in this course were required during the winter to prepare a thesis on an assigned subject. Those only who have passed a satisfactory examination in the elementary courses are permitted to attend. Fifty persons received this instruction.
4. N. H. 14. A course on Palæontology, by N. S. Shaler. Two lectures a week, with laboratory work and theses. Twelve students took this course.
5. N. H. 15. A course in Historical Geology, by N. S. Shaler, designed to train students in the determination of geological horizons; attended by one student.
6. N. H. 16. A course in field-work, designed to afford special training in the processes of geological surveying, by N. S. Shaler, W. M. Davis, J. E. Wolff, and T. W. Harris; attended by seven students.

During the winter season the students in advanced classes attended regular evening meetings designed to serve the purpose accomplished by the Seminaria of the German Universities.

During the summer of 1890, forty-two students received instruction in the field. This instruction was given in three graded schools, one of which, the elementary school, was taught in Cambridge, and the other two in New York, Connecticut, Massachusetts, New Hampshire, and Maine. Instruction in these courses was given by N. S. Shaler, W. M. Davis, J. E. Wolff, and T. W. Harris, with the assistance of Prof. H. S. Williams of Cornell University and Dr. W. B. Clarke of Johns Hopkins, who collaborated with the other instructors in the work done in New York and Massachusetts.

During the year, the following books and papers of a scientific nature have been published by N. S. Shaler: —

1. Aspects of the Earth. The Popular Account of some Familiar Geological Phenomena. New York, Charles Scribner's Sons, 1889, pp. xix. and 344. Sixty-eight Illustrations.
2. The Geology of the Island of Mt. Desert, Me. Eighth Annual Report of the Director of the United States Geological Survey, pp. 987–1061. Thirty Illustrations and Two Maps. Washington, D. C., Government Printing Office, 1889.
3. Soils of Massachusetts. A Lecture delivered at the Annual Meeting of the Massachusetts State Board of Agriculture, February 6, 1890. Wright and Potter Printing Co., State Printers, Boston, 1890, pp. 16.
4. The Topography of Florida, with a Note by Alexander Agassiz. Bulletin of the Museum of Comparative Zoölogy, Vol. XVI., No. 7, pp. 139–158. With One Map.
5. Tertiary and Cretaceous Deposits of Eastern Massachusetts. Bulletin of the Geological Society of America, Vol. I. pp. 443–452. With One Plate.

The course in Elementary Physical Geography and Meteorology (Natural History 1) was again in the hands of Professor Davis. It was attended by seventy students. The increasing development of laboratory methods in this course make the employment of an Assistant desirable in the coming year. The advanced course in the same subjects was attended by one Graduate and one Senior.

The most important additions to the collections of the Laboratory during the year was a set of colored plaster models, designed by Professor Albert Heim, of Zurich. These represent a glacier in a lofty Alpine region; a torrent in a mountain region of less altitude; a bold coast line, with bars and dunes; and a volcanic island with a variety of cinder cones and lava flows. King's plaster models of Wisconsin have also been secured. A number of valuable maps have also been purchased, among which Haardt's Map of the Alpine System may be mentioned as the most successful representation of a great mountain range. A considerable number of smaller maps from various sources have been mounted on cardboard for use in the class-room.

During the period of the mid-year examinations, Professor Davis visited Baltimore to deliver a short course of lectures on Meteorology to the class in Physical Geography at Johns Hopkins University. In the April recess, he accompanied a party of students to the valley of the Upper Passaic, in New Jersey, to trace out the shore lines of a reputed glacial lake; the evidence discovered was incomplete, and somewhat contradictory. An account of the excursion was read to the Harvard Natural History Society by R. E. Dodge, of the Senior Class.

The following papers have been published during the year by W. M. Davis: —

Structure and Origin of Glacial Sand Plains. Bull. Geol. Sci. America, Vol. I., 1890, pp. 192–202, Plate III.

The Geographic Development of Northern New Jersey, by W. M. Davis and J. Walter Wood, Jr. Proc. Bost. Soc. Nat. Hist., Vol. XXIV., 1889, pp. 365–423.

The Rivers of Northern New Jersey, with Notes on the Classification of Rivers in General. Nat. Geogr. Mag., Vol. II., 1890, pp. 81–110.

The Intrusive and Extrusive Triassic Trap Sheets of the Connecticut Valley, by W. M. Davis and Charles Livy Whittle. Bulletin of the Museum of Comparative Zoölogy, Vol. XVI. (Geol. Series, Vol. II.), 1889, pp. 99–138. With Five Plates.

Ferrel's Convectional Theory of Tornadoes, by W. M. Davis and Charles Emerson Curry. Amer. Met. Journ., Vol. VI., 1889–90, pp. 337–349, 418–431, 448–463.

Dr. Hann's Studies on Cyclones and Anti-Cyclones. Science, May 30, 1890.

An Outline of Meteorology. Abstract of Six Lectures delivered to the Class in Physical Geography at the Johns Hopkins University in January, 1890. Johns Hopkins University Circular, May, 1890.

Secular Changes in Climate. A Paper read at the Eighteenth Meeting of the New England Meteorological Society at Providence, R. I., April 15, 1890. Amer. Met. Journ., Vol. VII., 1890, pp. 67–78.

Types of New England Weather, in Investigations of the New England Meteorological Society, reprinted from the Annals of the Astron. Observatory of Harvard College, Vol. XXI., Part II., pp. 116–137.

An Investigation of the Sea-Breeze, by W. M. Davis, L. G. Schultz, and R. DeC. Ward, Ibid., pp. 215–263. With Eight Plates.

Reviews of Ferrel's Popular Treatise on the Winds. Nation; Science. February 28, 1890.

Review of Blanford's Climates and Weather of India. Nation; Science.

Review of Wright's Ice Age in North America. Nation.

In Petrography instruction was given by Dr. Wolff during the year to three advanced students engaged in special investigation. This comprised the "Novaculite of Arkansas," the "Crystalline Rocks of the Narragansett Basin in Rhode Island," and the "Eruptive and Stratified Rocks of Essex County, Massachusetts."

The following contributions from the Petrographical Laboratory were published as Museum Bulletins: —

On Peratophyre from Marblehead Neck, Massachusetts, by John H. Sears.

On some Occurrences of Ottrelite and Ilmenite Schist in New England, by J. E. Wolff.

In the spring the rock collections and Laboratory equipment and the Whitney collection of rocks were moved into the upper rooms of the Petrographical Laboratory in the new Geological Section of the Museum, and the Chemical Laboratory and rock section machinery into the basement.

The Instructor continued during the year his study of the Crystalline Schists of the Eastern United States.

REPORT ON THE INSTRUCTION IN BIOLOGY.*

By Professors Farlow and Mark, Dr. D. D. Slade, and Mr. G. H. Parker.

The courses of instruction in Zoölogy for the Academic year 1889–90 were the same as in the preceding year, and were carried on by the same instructors.

There were eighty students in Nat. Hist. 2: one Graduate, ten Seniors, eleven Juniors, nineteen Sophomores, twenty-six Freshmen, seven Specials, and six Scientific Students. For laboratory work the class was, as usual, divided into sections. The Assistants were Mr. C. B. Davenport and Mr. N. B. Potter.

In Nat. Hist. 13 there were eight students. The lectures were increased somewhat beyond those of the previous year, and with the laboratory work embraced the anatomy and histology of Hydra, Asteracanthion, Tænia, and Lumbricus. Mr. W. M. Woodworth was assistant in the course.

There were eight persons in Nat. Hist. 9, all but one of them being Graduates. Early in the year Mr. Parker completed a paper on "The Eyes in Blind Cray-fishes," and he has also made considerable progress with his investigations on the comparative histology and development of the compound eyes in Crustacea. The plates illustrating an extended paper by Mr. C. B. Davenport on "Cristatella, the Origin and Development of the Individual in the Colony," have already been completed by the lithographer, and the text has been ready for the printer for some time. Mr. W. E. Ritter has written a paper on "The Parietal Eye in some Lizards from the Western United States," and Mr. W. M. Woodworth has completed the first of his studies on an interesting fresh-water Planarian, the title of his paper being, "Contributions to the Morphology of Turbellaria. I. On the Structure of Phagocata gracilis, Leidy." The engraving of the plates for Mr. E. R. Boyer's article "On the Mesoderm in Teleosts, especially the Source of the Mesodermic Elements which form the Limb-Bud," is in progress; and papers by Mr. W. Whitney, "Notes on the Nervous System of Thyone briareus, Lesueur," and by Mr. H. P. Johnson, "Studies on Direct Nuclear Division," are also finished.

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* Professor Farlow's Report will hereafter appear with the Report of the Botanical Department.

These papers will all be published in the Museum Bulletin as rapidly as the plates illustrating them can be engraved.

Since the last Annual Report Nos. XV., XVI., and XVII. of the "Contributions from the Zoölogical Laboratory" have been issued in the Museum Bulletin, viz.: — XV. Studies on Lepidosteus, by E. L. Mark, (9 plates,) February, 1890. — XVI. On the Egg Membranes and Micropyle of some Osseous Fishes, by C. H. Eigenmann, (3 plates,) March, 1890. — XVII. The Histology and Development of the Eye in the Lobster, by G. H. Parker, (4 plates,) May, 1890.

The meetings of the Zoölogical Club have been continued with regularity, and with the usual interest.

The instruction in Comparative Osteology, in charge of Dr. D. D. Slade, Nat. Hist. 21, during the academic year 1889–90, has been given by means of lectures, laboratory work, and frequent examinations. The course has been followed by two Seniors, two Graduates, and by three Special Students.

The course Nat. Hist. 5 was conducted in 1889–90 on the same plan as in the previous year, by Mr. G. H. Parker and Professor W. G. Farlow, assisted by Mr. W. A. Setchell. The number of students taking the course was larger than in any previous year, and inasmuch as the room was necessarily also occupied during a part of the time by the members of another course, whose students were more numerous than usual, it required careful arrangement to provide each student with the amount of space necessary for good work. The completion of the new Botanical Rooms, in which, in the future, the instruction of the botanical portion of Nat. Hist. 5 will be given, will relieve the crowding unavoidable during the present year.

The number of students taking Nat. Hist. 23 was also larger than usual, and, it being impossible to find places for them all in the Reptile Room, where the course had been given for the past few years, by the kindness of the Director of the Museum the class was allowed to use temporarily one of the new Geological

Rooms, which was fitted up for the purpose. Hereafter this course will be given in one of the new Botanical Laboratories, much to the relief of the other Laboratories, in which we have been for several years placed awaiting the completion of our new rooms.

The course in research in Cryptogamic Botany, Nat. Hist. 12, was taken by four students, two of whom received the degree of Ph. D., and one the degree of S. B., in June, 1890. Of the former, Mr. W. A. Setchell presented as a doctor's thesis a paper on the "Structure of some Laminariaceæ," which is to be printed soon. Mr. Setchell also published during the year a paper, "Concerning the Structure and Development of *Tuomeya fluviatilis*, Harv." Mr. W. C. Sturgis presented for his doctor's thesis a paper on the "Carpologic Structure and Development of the Collemaceæ and allied Groups." The two last named papers appeared in the Proceedings of the American Academy of Arts and Sciences. The thesis presented by Mr. G. J. Pierce, on "*Corticium Oakesii*, B. & C., and *Michenera artocreus*, B. & C.," is soon to be published. Mr. H. M. Richards also presented a paper entitled "Notes on *Zonaria variegata*, Lamx.," which has already appeared in the Proceedings of the American Academy of Arts and Sciences.

REPORT ON THE OSTEOLOGICAL DEPARTMENT.

By D. D. Slade.

THE collection has received no additions during the past year, although such would be very desirable, especially in the orders of the Insectivora and Cheiroptera. It has been consulted by gentlemen connected with the other departments of the University for the purposes of special study and comparison. Occasional specimens have been brought in by strangers for determination.

The entire collection is in good condition, and has received no material damage by its use for illustration and study. No specimens have been lost.

A paper in Science, July 25, 1890, on "The Absence of the Patella in Marsupials," has been published; also nearly ready for publication, "The Significance of the Zugal Arch in the Mammalia."

REPORT ON THE MAMMALS AND BIRDS.

By William Brewster.

The past year has been singularly uneventful as far as this department is concerned. Only two specimens have been given to the Museum; a star-nosed mole, by Miss Jennie White, and a parrot, by Mr. F. W. Story. The latter is in Ward's hands for mounting. A dusky duck (*Anas obscura*), a cormorant (*Phalacrocorax carbo*), a gannet (*Sula bassana*), and a brant (*Branta bernicla*), have been purchased by Mr. Agassiz for the mounted collection in the Atlantic Room.

By an exchange with the American Museum of New York, the Cambridge Museum has also received fourteen skins of ground squirrels of the genus Tamias, representing about eight species new to our collection.

The following material has been lent to specialists for study and elaboration: to Mr. J. A. Allen the entire series of skins of mice (*Muridæ*) and ground squirrels (*Tamias*); to Mr. D. J. Elliot certain specimens of the woodhewers or tree-creepers (*Dendrocolaptidæ*); to the Marquis Doria, of Genoa, all the bats and some of the moles in the Alcoholic Collection.

Mr. Allen has returned the ground squirrels after carefully identifying and labelling them in accordance with his late rearrangement* of this difficult group. He still retains the mice, pending the completion of his study of that family.

Mr. Elliot's investigations have resulted in a paper entitled "A Study of the Genus Dendrornis and its Species." †

Nothing has yet been done towards the rearrangement of the Alcoholic Collection of Birds, which at present is not in condition for convenient reference. The other collections in this department are in excellent order, and wholly free from insect pests.

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* See "A Review of the North American Ground Squirrels of the Genus Tamias." Bull. Am. Mus. Nat. Hist., Vol. III., No. 1, May, 1890, pp. 45–116.

† The Auk, Vol. VII., No. 2, April, 1890, pp. 160–189.

The Assistant has published the following notes and papers in "The Auk": —

"The Present Status of the Wild Pigeon (*Ectopistes migratorius*) as a Bird of the United States, with some Notes on its Habits."

"Birds through an Opera Glass." (Review of a book by Miss Florence A. Merriam.)

"Nesting Habits of the Parrakeet (*Conurus carolinensis*)."

"Melanerpes carolinus eating Oranges."

"The Little Brown Crane (*Grus canadensis*) in Rhode Island."

"Capture of a Canada Jay (*Perisoreus canadensis*) near Cambridge, Massachusetts."

"Bullock's Oriole in Maine."

"Recent Occurrence of the Turkey Vulture in Eastern Massachusetts."

"Capture of a Third Specimen of the Barn Owl in Massachusetts."

"Food of Young Humming-birds."

"The Purple Grackle at Charleston, South Carolina."

"The Acadian Sharp-tailed Sparrow and Scott's Seaside Sparrow on the Coast of South Carolina."

In "Forest and Stream": —

Two notes without formal titles relating to the occurrence of the Evening Grosbeak (*Coccothraustes vespertina*) in New England.

REPORT ON THE REPTILES AND FISHES.

By Samuel Garman.

Comprehensive series of the Fishes have been sent as exchanges to the Australian Museum of Sydney, the British Museum of London, the Imperial Academy of Sciences of St. Petersburg, the K. Gesellschaft der Wissenschaften of Göttingen, the K. K. Academie der Wissenschaften of Vienna, the Königl. Zoologische Sammlung of Berlin, the Museo Civico of Milan, the Museum d'Histoire Naturelle of Paris, the Queensland Museum of Brisbane, the Smithsonian Institution of Washington, the Universitetets Zoologiske Museum of Copenhagen, and the Zoolog. Museum Universitetet of Christiania. To the shipment for St. Petersburg there was added a series of the Reptiles and Batrachians. Other Fishes and Reptiles were furnished Prof. A. Goette, Dr. R. Semon, Prof. B. G. Wilder, and the instructors and students of the University.

We are pleased to acknowledge the following receipts: — Yucatan Reptiles and Batrachians from the Hon. Edward Thompson; a large number of Missouri Cave Animals, both vertebrates and invertebrates, from Miss Ruth Coffin; various lots of New England species, from Miss Reed, Messrs. Frank Bolles, N. Vickary, W. J. Wright, and Dr. L. C. Jones; Mississippi Valley species, from Professors H. Garman and G. H. Parker; and California Reptiles, from Mr. W. E. Ritter. An excellent collection of Reptiles, Batrachians, Fishes, and Selachians was received from the Australian Museum, and a valuable representation of Pacific Coast Fishes from Prof. C. H. Eigenmann. Important additions of Tropical Reptiles and Batrachians have been made by exchanges with Mr. N. L. Wilson. A number of purchases of desiderata from South America and the Old World have contributed materially to the completeness of the collections. With rare exceptions, all arrivals were good in kind and condition.

The mounted specimens of Sharks and Skates, returned by Professor Ward, add greatly to the attractiveness of the Atlantic Room.

As heretofore, in taking care of the material attention has not been confined to the Reptiles and Fishes.

The publications concerning these departments include "A Revision of the Edentulous Genera of Curimatinæ," by Carl H. Eigenmann and Mrs. R. S. Eigenmann, in the Annals of the New York Academy of Science, Vol. IV., and the following by the present writer, besides unsigned reviews, notices, and articles less directly connected with ichthyology and herpetology.

In the Bulletin of the Museum: —

"Cave Animals from Southwestern Missouri."

In the Bulletin of the Essex Institute: —

"On the Species of the Genus Chalcinus."
"On Species of Gasteropelecus."
"On Species of Cynopotamus."
"On the Species of Anostomus."

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

By Dr. H. A. Hagen.

The collection is in very good condition. The vulcanized stoppers of the small vials in the Biological Collection had to be changed for pure rubber stoppers. (See Canad. Entom., 1886, Experience with Rubber Stoppers in the Biological Collection.) The larger vials were in good order; of the medium size, representing the largest number in the collection, very few needed a change of the stoppers. The importance of the subject had induced me to make observations through a number of years. A test vial of the medium size, 70 mm. long, 16 mm. broad, was filled, October, 1878. The air bubble retained in the vial was carefully measured, and was 14 mm. long; next summer it was smaller, owing to the greater expansion of the alcohol, proving at the same time the close fitting of the stopper. 14 November, 1880, the bubble was 20 mm. long; 12 November, 1888, it was 30 mm.; 10 August, 1890, it was 40 mm. long. So it can probably stay many years longer without refilling.

The collection of Dr. John L. LeConte has been placed in the new cabinets presented last year to the Museum by Mrs. LeConte. They are the best ever provided for the Museum. Each box is marked "LeConte's Collection," and all are numbered as separate series. Each box contains two of the original boxes, with the original covers. Sufficient space is left to arrange some parts too much crowded in the old boxes. The whole collection is in excellent condition, and free of pests. It is impossible to suggest a better and safer arrangement for such a valuable treasure.

Six new cabinets have been received for the Museum Collection.

Additions have been received from Mr. F. Blake, Weston, Mass., Insects collected in Peoria, Illinois; Mr. P. H. Dudley, NewYork, an interesting lot of White Ants from Panama; Mr. F. W. Putnam, Cambridge, a Bombus nest with parasites from Ohio; Mr. J. G. Jack of the Arboretum, additions to the Biological Collection; Mr. D. W. Coquillett, Los Angeles, Cal., Neuroptera; Mr. Sam. Henshaw, Cambridge, additions to the Biological Collection; and from Dr. Henry J. Bowditch, August 15, 1890, a living colony of Psocus venosus, Br., from Peterborough, N. H.

Changes and improvements have been made in the collection of Lepidoptera and in the Biological Collection. The Odonata are now ready, and alone fill a whole cabinet. The new specimens of the other orders are now in the right place.

The following papers from this department have been published during the last year: —

Louis Cabot. The Immature State of the Odonata. Part III. Subfamily Cordulina. Memoirs of the Museum of Comparative Zoölogy, Vol. XVII., No. 1, with Six Plates. Of the next part, four plates are ready for next year, finishing the Libellulina. Only one part more, containing all the Agrionina, is to follow, to finish the large and very important work on the immature state of the Odonata contained in the collection of the Museum.

H. A. Hagen. Unsere gegenwärtige Kenntniss der Ephemerinen. Stettiner Entomologische Zeitung, 1890, Vol. LI. pp. 11–13.

New Synopsis of the Odonata of North America: —

1. Calopterygina. Psyche, Vol. V., 1889, No. 164, December, pp. 241–250.
2. Anax. Ibid., No. 166, February, 1890, pp. 303–308.
3. Two Species of Anchora. Ibid., No. 170, June, pp. 353–355.
4. Cordulina. Ibid., No. 171, July, pp. 367–373, with One Plate.
5. A Synopsis of the Odonat Genus Leucorhinia, Br. Trans. Amer. Ent. Soc., Philadelphia, July, 1890, Vol. XVII. pp. 229–236, One Plate.

Baron Ed. de Selys-Longchamps, Comptes Rendus de la Société Entomologique de Belgique, Vol. II., No. 2, July 5, 1890, pp. lxvi.–lxx., has given a report on the publications of Dr. Hagen, Nos. 1 and 2, and on some remarks by him on recent Odonata of America.

REPORT ON THE CRUSTACEA.

By Walter Faxon.

During the year past the collection of Crustacea has been thoroughly overhauled and put into perfect order. Material has been brought together to illustrate the Pacific and Indo-Asiatic Faunæ. Exchanges have been made with the United States National Museum, the Massachusetts Fish Commission, Professor F. W. Cragin, etc. Our collection of Caprellidæ has been returned by Dr. P. Mayer. It has furnished valuable material to Dr. Mayer in the preparation of his supplement to the Monograph of the Caprellidæ (Fauna und Flora des Golfes von Neapel), published at Berlin during the current year. I have published a Supplement to my Revision of the Astacidæ, based upon the material in our Museum and in the United States National Museum, in the Proc. U. S. Nat. Mus., Vol. XII.

REPORT ON THE PALÆONTOLOGICAL COLLECTIONS.

By Alpheus Hyatt.

The work on the collection of Trilobites, which consists in getting together all the species of each genus, and the selection of appropriate specimens for exhibition in the Stratigraphical Collections, was continued during the first part of the year. This process not only eliminates materials suitable for exhibition from the mass of the collections, but also greatly improves the accessibility and arrangement of the latter, and considerably diminishes the space occupied by them in the rooms where they are stored. The greater part of the Assistants' time has, however, been given to a revision of the magnificent collection of Fossil Cephalopods for the express purpose of selecting representative forms of the genera for exhibition in the Systematic Collection.

The Schary Collection furnished the larger number of the Palæozoic types, and the whole of this has been roughly revised and brought into one room together with all the other collections of Fossil Cephalopoda, and the specimens arranged in their appropriate generic groups. Quite a number of genera were more or less closely revised in order to bring them up to the latest published investigations, and representatives of the new groups into which they have been divided were picked out, but most of this work was necessarily of a preliminary nature, not including any close revision of species, and much still remains to be done before this class of fossils can be reported as finished. The magnitude of some parts of this collection is certainly astonishing, the specimens of the Schary Collection representing the Orthoceratidæ, although stored with strict attention to economy of space, now occupy one hundred and ninety-four trays, and number about eleven thousand specimens, and approximately about eighty species.

During the progress of the dusting of this and other collections, a very considerable number of specimens have been found which would very soon have been destroyed by oxidation. Such a collection should be looked over carefully every two or three years, and the specimens fossilized in iron pyrite protected with several thick coats of varnish. Miss Clark has also been occupied in mounting specimens for exhibition, and in labelling.

This department is indebted to Dr. Robert T. Jackson for considerable work in various directions. He has superintended the moving of collections, has concentrated and in part culled the Anticosti Collection, separating the useless from the valuable materials. He has also arranged and concentrated the Cretaceous and Tertiary Pelecypoda which were widely scattered, picking out species suitable for exhibition in the Stratigraphical Collection, and has also done the same service for several small collections, consisting for the most part of Mollusca and Gasteropoda, but containing some species from all departments of the animal kingdom. This work has put into available condition for final arrangement or study a large amount of material that before was widely scattered, and given considerable free space in the cases. Dr. Jackson has also worked on the large and valuable materials of the Dyer Collection, revising all the portions not previously arranged, and roughly classifying them. This is now ready for distribution into genera, and it should be stated, for the benefit of future students, that the collection, although it was carefully numbered by Mr. Dyer with printed numbers, was probably never catalogued by him. No catalogue was ever sent, so far as can be ascertained, with the collection, and the Assistant, after inquiring of several geologists well acquainted with Mr. Dyer, has come to the conclusion that the numbers merely represent Mr. Dyer's intentions. Fortunately, a considerable number of the ordinary run of the specimens are labelled, and all the types, so that no important losses of localities will be occasioned by the absence of a catalogue.

Mr. Frank Springer spent some time in studying the collection of Crinoids, and borrowed material of this group for investigation by Mr. Wachsmuth and himself. Several slabs of Trilobite tracks were received from the New York State Natural History Museum. Three boxes of fossils were received from Mr. Springer, containing a small but valuable collection of Cretaceous Fossils, and the skull of a mammal from New Mexico.

During the past year the following papers have been published by the Assistants in the department: —

Genesis of the Arietidæ, by Alpheus Hyatt, pp. 238, with six Genealogical Tables, fourteen plates and twenty-nine figures in the text. Published jointly by the Smithsonian Institute and the Museum in the "Smithsonian Contributions to Knowledge," No. 673, Washington, 1889, and in the Memoirs of the Museum of Comparative Zoölogy, Vol. XVI., No. 3.

Rot in Iris Germanica, by Robert T. Jackson. Garden and Forest, Vol. II. p. 522, 1889.

Phylogeny of the Pelecypoda, Studies of the Aviculidæ and their Allies, by Dr. Robert Tracy Jackson, Memoirs of the Boston Society of Natural History, Vol. IV., No. 8, 1890, pp. 277–400, with fifty-two figures and eight plates. Thesis offered for the Degree of Doctor of Science in Harvard University, May, 1889.

REPORT ON THE LIBRARY.

By Miss F. M. Slack.

During the year ending September 1, 1890, the Library has received 683 volumes, 1,991 parts, and 75 pamphlets: —

	VOLUMES.	PARTS.	PAMPHLETS.
Gift	11	46	9
Exchange	125	768	40
Purchase	124	217	
A. Agassiz	81	844	26
Binding Parts	267		
Whitney Library	75	116	
	683	1991	75

The number of volumes now in the Library (exclusive of pamphlets and the greater part of the Whitney Library) is 19,102. There are 13,219 pamphlets bound in 2,158 volumes, making the total number of volumes 21,260.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE ACADEMIC YEAR 1889-90.

Of the Bulletin.

Vol. XVI. [Geological Series, Vol. II.]

No. 6. The Intrusive and Extrusive TRIASSIC TRAP SHEETS of the Connecticut Valley. By W. M. DAVIS and C. L. WHITTLE. pp. 40. 5 Plates. December, 1889.

No. 7. The TOPOGRAPHY of FLORIDA. By N. S. SHALER. With a Note by A. AGASSIZ. pp. 10. Plate. March, 1890.

No. 8. On Some Occurrences of OTTRELITE AND ILMENITE SCHIST in New England. By J. E. Wolff. pp. 7. April, 1890.

No. 9. On KERATOPHYRE from Marblehead Neck, Massachusetts. By J. H. SEARS. pp. 6. July, 1890.

(Vol. XVI. *to be continued.*)

Vol. XVII.

No. 5. The MORPHOLOGY OF THE CAROTIDS, based on a Study of the Blood-vessels of Chlamydoselachus anguineus, Garman. By H. AYERS. pp. 34. Plate. October, 1889.

No. 6. CAVE ANIMALS from Southwestern Missouri. By S. GARMAN. pp. 16. 2 Plates. December, 1889.

Vol. XIX. [Complete.]

No. 1. Studies on LEPIDOSTEUS. Part I. By E. L. MARK. pp. 128. 9 Plates. February, 1890.

No. 2. On the EGG MEMBRANES and MICROPYLE of some Osseous Fishes. By C. H. EIGENMANN. pp. 26. 3 Plates. March, 1890.

No. 3. Report on the Results of Dredging by the United States Coast Survey Steamer "Blake." — XXXII. Report on the NUDIBRANCHS. By R. BERGH. pp. 28. 3 Plates. March, 1890.

No. 4. A Third Supplement to the Fifth Volume of the TERRESTRIAL AIR-BREATHING MOLLUSKS of the United States and Adjacent Territories. By W. G. BINNEY. pp. 44. 11 Plates. May, 1890.

Vol. XX.

No. 1. The Histology and Development of the EYE in the LOBSTER. By G. H. PARKER. pp. 60. 4 Plates. May, 1890.

(Vol. XX. *to be continued.*)

Of the Memoirs.

Vol. XVI.

No. 3. GENESIS OF THE ARIETIDÆ. By A. HYATT. pp. i.–xii., 288. 14 Plates and 6 Tables. Published in Conjunction with the Smithsonian Institution. December, 1889.

(Vol. XVI. *is completed.*)

Vol. XVII.

No. 1. The Immature State of the ODONATA. Part III. Sub-family CORDULINA. By LOUIS CABOT. pp. 52. 6 Plates. February, 1890.

[B]

INVESTED FUNDS OF THE MUSEUM.

In the hands of the Treasurer of Harvard College, Sept. 1, 1889.

Sturgis-Hooper Fund	$100,000.00
Gray Fund	50,000.00
Agassiz Memorial Fund	297,938.10
Teachers and Pupils Fund	7,594.01
Permanent Fund	117,469.34
Humboldt Fund	7,740.66
	$580,737.11

The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Curator. The accounts are annually examined by a committee of the Museum Faculty. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts with vouchers to the payment of which the income is applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Humboldt Fund can be applied for the benefit of one or more students of Natural History, either at the Museum, the Newport Marine Laboratory, the United States Fish Commission Station at Wood's Holl, or elsewhere.

Applications for the Tables reserved for advanced students at the Newport Marine Laboratory, and for the Tables at the Wood's Holl Station, should be made to the Curator of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

Mus.120.20.6

With the Compliments of

ALEXANDER AGASSIZ.

ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE,

FOR

1890-91.

CAMBRIDGE, U.S.A.:
UNIVERSITY PRESS; JOHN WILSON AND SON.
1891.

Case Shelf

LIBRARY
OF THE
Peabody Museum of American Archæology and Ethnology
IN CONNECTION WITH HARVARD UNIVERSITY.

PRESENTED BY
A. Agassiz.

Received Dec. 31, 1891.

6

Cambridge, Mass

ANNUAL REPORT

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FACULTY OF THE MUSEUM.

CHARLES W. ELIOT, *President.*
ALEXANDER AGASSIZ, *Curator.*
JOSIAH D. WHITNEY, *Secretary.*
GEORGE L. GOODALE.
HENRY P. WALCOTT.

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JOSIAH D. WHITNEY	*Sturgis-Hooper Professor of Geology.*
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NATHANIEL S. SHALER	*Professor of Geology.*
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C. B. DAVENPORT	*Instructor in Zoölogy.*
WALTER FAXON	*Assistant in Zoölogy.*
D. D. SLADE	*Assistant in Osteology.*
SAMUEL GARMAN	*Assistant in Herpetology and Ichthyology.*
WILLIAM BREWSTER	*Assistant in Ornithology and Mammalogy.*
ALPHEUS HYATT	*Assistant in Palæontology.*
H. M. KELLY	*Assistant in the Zoölogical Laboratories.*
RICHARD ELWOOD DODGE	*Assistant in the Geological Laboratories.*
J. BACKUS WOODWORTH	*Assistant in the Geological Laboratories.*
HENRY BARNARD KUMMEL	*Assistant in the Geological Laboratories.*
LOUIS GARDNER WESTGATE	*Assistant in the Geological Laboratories.*
ROBERT DeCOURCEY WARD	*Assistant in the Geographical Laboratory.*
MISS F. M. SLACK	*Librarian.*
MAGNUS WESTERGREN	*Artist.*

REPORT.

To the President and Fellows of Harvard College:—

During the past year the usual courses of instruction have been given at the Museum in Zoölogy by Professor Mark, Dr. Slade, and Mr. Parker, assisted in the Laboratory work by Messrs. W. M. Woodworth, Ritter, and Hubbard.

Professors Whitney, Shaler, and Davis, and Dr. J. E. Wolff, gave courses of instruction in Geology, Palæontology, Physical Geography, and Petrography. Messrs. Harris, J. B. Woodworth, Cobb, and Tarr were the Assistants in the Undergraduate instruction of the Geological Department.

For the details of these courses of instruction, as well as of the summer courses in Geology, I would refer to the accompanying special reports of the Professors and Instructors.

Professor Farlow's report upon the Botanical part of the introductory course of Natural History will appear in the report of the Botanical Department.

The Geological Section of the Museum has been occupied during the past year, and its Laboratories and Lecture Rooms have been found well adapted to their purpose. No progress has as yet been made in the equipment of the Geological and Geographical Museum, but the rooms are used to establish a connection between the Exhibition Rooms of the Museum of Comparative Zoölogy and the Botanical and Mineralogical Collections of the University Museum.

An extensive addition has been made to the Newport Marine Laboratory, so that there is now ample accommodation for eight advanced students, beside the space occupied by myself and assistant. Additional room is thus provided for the housing of books, drawings, and other records in use at the Laboratory. Messrs.

Woodworth, Davenport, Smith, Ward, Nickerson, and Lucas spent some time at the Newport Laboratory, either collecting material for future investigation, or carrying on special work on the embryology of Annelids, Bryozoa, and Acalephs. Mr. Woodworth also passed a few days at Newport before the opening of the season in putting the Laboratory in order for work.

We have to thank Colonel Marshall McDonald, United States Fish Commissioner, for facilities granted our students in connection with their work, by the Fish Commission Station at Wood's Holl.

There have been no changes in the Exhibition Rooms beyond the additions made to fill gaps existing in our series. The collections open to the public remain in a satisfactory condition, and the interest in the exhibit does not appear to diminish, judging from the constantly increasing number of visitors.

The Pacific Room is little by little preparing for exhibition, and I hope to open it to the public as soon as we can make a reasonably interesting exhibit of the fauna of some of its groups of islands. We have been for some time accumulating collections from the Sandwich Islands, the Galapagos, and the Feejee Islands.

The most important addition to our Exhibition Rooms has been the mounted skeleton of the fine Sperm Whale obtained through Professor Ward, mentioned in my last Report. This skeleton has been suspended from the roof of the large Exhibition Room devoted to the Systematic Collection of Vertebrates, and finds its place naturally by the side of the two other large skeletons of whales similarly placed.

The magnificent series of Pampas Fossils obtained by Professor Ward have been mounted by him, and safely moved to Cambridge from Rochester. They occupy a part of the central floor space of the rooms devoted to the Tertiary Faunæ. A few other specimens of extinct Vertebrates have been moved to the same rooms, so that as soon as the specimens are labelled it will be possible to open two of the Palæontological Exhibition Rooms to the public. They will, however, contain at first only a small part of the collections they are intended to house.

It will be seen from the special Reports of the Assistants, that the collections of the Museum continue in good condition. Owing to Dr. Hagen's prolonged ill-health, he has been able to give but little time to the Museum, and has been unable to make his usual Report. The collections have been kept in excellent condition, but of course, owing to his absence, they could not be placed at the disposal of specialists, as has always been the case heretofore.

Mr. J. A. Allen, of the Museum of Natural History of New York, has returned the collection of Muridæ which had been sent to him for study.

Professor Harrison Allen, of Philadelphia, has returned the collection of Bats sent to aid him in the preparation of a monograph on the family, for the Smithsonian Institution.

Messrs. Scott and Osborn have returned an additional invoice of the collection of Western Fossils lent to them.

Professor S. I. Smith, of New Haven, has returned the part of the "Blake" Crustacea remaining in his possession.

Professor Solas, of Dublin, has sent back a few of the types of the "Blake" and other Sponges.

Messrs. Scudder and McMurrich have returned drawings of Lepidoptera and of Actiniæ, which had been lent to them for examination.

We have received from Messrs. Wachsmuth and Springer a number of Palæozoic Crinoids; from Mr. Charles Chilton, a collection of New Zealand Crustacea; from the Zoölogical Museum of the University of Copenhagen, a collection of Fishes and Invertebrates from the Kara Sea, made by the Expedition of the "Dijmphna"; from the Paris Museum, a collection of Deep-sea Fishes, mainly from the "Travailleur" and "Talisman" Expeditions; from Mr. Arthur H. Gordon, an interesting collection of Lepidoptera from Central China; and from Lieut. Commanding J. F. Moser, a collection of Corals from the submarine cable between Key West and Havana, illustrating the rate of growth of corals. (See the Museum Bulletin, Vol. XX. No. 2.)

In addition to the specimens purchased from Professor Ward, we have also filled a few gaps in our collection of Reptiles, mainly for the Exhibition Rooms.

With the exception of an exhaustive Report on the Paguridæ of the "Blake" Expedition, for which the Museum is indebted to Professor Alphonse Milne-Edwards, the Blake publications and collections remain in the same state as last year. The Report of Professor Milne-Edwards is accompanied by twelve beautifully executed plates. The Report will be published as soon as the plates can be reproduced. It will form an important contribution to our knowledge of the Paguridæ. Messrs. Goode and Bean hope to finish their Memoir on the "Blake" Fishes within a few weeks. Fair progress has been made on the Memoirs and Bulletins mentioned in my last Report as preparing for the press, and the greater part will undoubtedly be issued during the coming year.

Appendix A of this Report contains a list of the publications of the Museum issued during the past academic year. We have published twelve Bulletins in the Zoölogical Series, making nearly two volumes of the Bulletin. With the exception of one number by Messrs. Scott and Osborne, and three short Bulletins by myself, the publications represent work done in the Zoölogical Laboratory in charge of Professor Mark. The activity in that Laboratory shows the excellent use which can be made of our publications in bringing out such original work as may be considered worthy of publication by the instructors in the various departments connected with the Museum.

Among the publications based upon Museum materials, I may mention a Review of the South American Nematognati, by C. H. and Rosa S. Eigenmann, published in occasional papers of the California Academy, I., July, 1890. Nearly the whole of this systematic paper is based upon the collection of Catfishes made by Professor Agassiz during the Thayer Expedition. The authors, with the alacrity with which impracticable plans are so readily laid out for others, needlessly go out of their way to criticise the state of the collection as left by Dr. Steindachner, and give the Museum excellent advice as to what ought to have been done with this collection when it was first brought together.

Professor W. B. Scott has published in the American Journal of Morphology an extensive paper on the Osteology of Pœbrotherium, based in part upon Museum material.

Professor Osborn has kindly made out for future use of the Museum a list of our desiderata in Western Fossils, both generic and stratigraphic.

I ought also to mention a short paper on Nettastoma by Dr. Bürger, published in a recent number of the Zoologische Jahrbücher, IV., the material for which was obtained from the Newport Laboratory.

The additions to our Library show a satisfactory increase in the number of accessions, especially from the exchanges with other institutions. Among the latter I must specify an important addition to our Geographical Library, consisting of a number of Government Surveys and Reports of Geographical Institutions, with extensive series of their maps and publications. These have been generously sent to us in exchange for our Geological publications, and with the full knowledge of how small a return we were able to make for their magnificent publications.

Last fall I was invited by Colonel Marshall McDonald, the U. S. Fish Commissioner, to take charge of a deep-sea dredging expedition off the coasts of Central America and of Mexico. With the consent of the President of the United States, the "Albatross" Lieut. Commander Z. L. Tanner, Commanding, was ordered to Panama, where I joined her in February. Our cruise extended from Panama to Cocos Island, thence south toward Malpelo, and back to Panama. Our second cruise ran from Panama to Galera Point, thence to the Galapagos, and from there to Acapulco; and in May I left the expedition at Guaymas, after a short exploration of the Gulf of California. The letters written on the voyage to Colonel McDonald give a preliminary account of this trip; they have been published in the Museum Bulletin (Vol. XXI. No. 4), and a more extended account of the expedition is in preparation. The collections made have arrived safely at Washington, and, with the consent of Colonel McDonald, arrangements have been made for the publication of the results in the Memoirs and Bulletins of the Museum. The following gentlemen have kindly agreed to work up the collections: Dr. P. H. Carpenter, the Comatulæ; Professor S. F. Clarke and Mr. Peabody, the Hydroids; Dr. W. H. Dall, the Mollusks; Mr. C. B. Davenport, the Bryozoa; Professor Faxon, the Crustacea; Professor W. E. Hoyle, the Cephalopods; Mr. S. Garman, the Fishes; Dr. Goes, the Foraminifera; Dr. V. Lendenfeld, the Phosphorescent Organs of Fishes; Professor Ludwig, the Holothurians; Professor Lütken, the Ophiurans; Dr. John Murray, the specimens of the bottom; Professor Mark, the Actinians; Professor Studer, the Gorgonians; Dr. W. M. Woodworth, the Planarians; and Dr. H. V. Wilson, the Sponges. I shall myself undertake the general account of the Pelagic Fauna, the Acalephs, and the Sea Urchins. The groups forming the remainder of the collection will probably be distributed during the coming winter.

Twice before I had been on the point of making an exploration of the deep waters of the Pacific off Panama. Once my plans were disarranged by the breaking out of war between Chili and Peru, and three years ago, when the "Albatross" was on her way from New York to San Francisco, I was unable to meet her at Panama, although she was detained there for a time by the Fish Commissioner, in hopes I might be able to join the ship before she left for the Galapagos. I find it difficult to express my obligations to Colonel McDonald for having given me the opportunity of accompanying the "Albatross" on her second cruise, and of carrying on the explorations of the past winter in so new and so interesting a field on a vessel so admirably adapted and equipped for the purpose as the "Albatross," and commanded by so experienced and enthusiastic deep-sea dredger as Lieut. Commander Tanner. To Mr. Richard Rathbun, Assistant of the U. S. Fish Commission, I must express my thanks for the care, interest, and patience with which he attended to the endless details connected with the fitting out of the "Albatross" for her voyage.

We are unfortunately compelled for want of funds gradually to restrict the work of the assistants of the Museum to the mere care and maintenance of the collections, and to limit their use by specialists. Our inability to engage a sufficient number of assistants compels us to refuse many of the constant demands made upon the administration of the Museum for an opportunity of working up or of examining parts of our collections, the value of which to science is thus greatly diminished. It is true we have a number of volunteér assistants, but we cannot expect these gentlemen, who have kindly undertaken the general supervision of special departments, to spend their time in the drudgery necessary to meet the legitimate demands which every fairly organized Museum ought to be able to meet, and which are naturally made upon our collections and assistants. With the exception of Dr. Hagen and Mr. Garman, there is no assistant upon whom I feel at liberty to call for work of that kind. The annual expenditure of a comparatively moderate sum would go far to remedy the unfortunate attitude we are compelled to assume towards specialists. But I need not dwell upon the unsatisfactory condition of the Museum finances. As I have stated in former Reports, it is no longer practical for me, in connection with other plans I have in view, to continue to give to the Museum the support, or to devote to its interests the time it has hitherto received from me. It is becoming self-evident that an attempt to establish at Cambridge a Museum devoted to original investigation, in addition to its other functions of providing a University Museum and Laboratories, is not destined to be carried out. We cannot compete with the general government or municipal institutions without an endowment or resources far greater than any University can hope to obtain, and the sooner the future plans of the Museum are modified to meet the existing state of things, the less will be the waste, and the sooner shall we adapt our organization to the comparatively limited field of a University establishment.

ALEXANDER AGASSIZ.

CAMBRIDGE, October 1, 1891.

REPORT OF THE STURGIS-HOOPER PROFESSOR OF GEOLOGY.

By Josiah D. Whitney.

During the year a course of lectures was given on Mineral Veins and Metalliferous Deposits, with special reference to the mode of occurrence and utilization of the useful metals and their ores, the course forming an introduction to the sciences of Mining and Metallurgy. This course was attended by about twenty students, mostly Seniors, with a few Graduates.

The slides belonging to the lithological collections, mentioned in the last Report as having been transferred to the keeping of the Instructor in Petrography in the College (Dr. Wolff), still remain in the hands of Professor Wadsworth, Director of the Michigan Mining School, and no recent information has been received from him in regard to the preparation of the report intended as the continuation of the "Lithological Studies," of which the first part was published in the Museum Memoirs several years ago. These slides would be useful, as a necessary complement of the collection to which they belong, for the Instructor in Petrography, and should be returned unless Professor Wadsworth finds himself able within a reasonable time to prepare a report on the same.

The beginning of cataloguing the library belonging to this department has been made by Miss Clark, and a portion of the books temporarily arranged on the shelves. A considerable number of volumes have been transferred to the Museum Library. The shelf room, however, is quite inadequate for the proper arrangement of the books, and it is necessary that more room be provided, or that the Geological and Mining Library belonging to this department be divided up in some such way as shall be found to be best suited to meet the wants of those who desire to use it.

Most of the time of the Sturgis-Hooper Professor has, during the past year, been given to work on the Century Dictionary, which work is now finished, the last part of the Dictionary being all in type, and almost ready for publication.

The Sturgis-Hooper Professor proposes now to resume his investigations into historic and prehistoric changes of climate, the first part of which was published in the Museum Memoirs, under the title of "Climatic Changes of Later Geological Times," in 1882.

REPORT ON THE GEOLOGICAL DEPARTMENT.

By Professors J. D. Whitney, N. S. Shaler, and W. M. Davis, and Dr. J. E. Wolff.

During the Academic year 1890–91, the following named courses of instruction were given in the Geological, Geographical, Petrographical, and Palæontological Laboratories, and in the field, by the instructors in the department.

1. Geol. 4. A course in Elementary Geology, by N. S. Shaler. Two lectures a week, with certain required reading; attended by two hundred and fifty-eight students.

2. Geol. 4 *a*. A course of practical Geological Exercises in the laboratory and in the field, by T. W. Harris, assisted by R. S. Tarr and J. B. Woodworth, designed especially for those who intend in subsequent years to continue the study of Geology and Palæontology. Attended by one hundred and four students.

3. Geol. 8. A course of Advanced Geology, two lectures a week, by N. S. Shaler, together with assigned reading and field-work, conducted by W. M. Davis and J. E. Wolff. Students in this course were required during the winter to prepare theses on assigned subjects. Those only who had passed a satisfactory examination in the elementary courses were permitted to attend. Forty-three persons received this instruction.

4. Geol. 9. A course in Structural Geology, by T. W. Harris. Two lectures a week with required reading and theses. Six students took this course.

5. Geol. 14. A course in Palæontology, by N. S. Shaler. Two lectures a week, with laboratory work and theses. The course was attended by eleven students.

6. Geol. 20 *b*. A course in field-work, designed to afford special training in the processes of geological surveying, by N. S. Shaler, W. M. Davis, J. E. Wolff, and T. W. Harris. Attended by sixteen students.

7. Geol. 1. A course in Elementary Meteorology, by W. M. Davis. First half-year. Two lectures a week, with recitations and laboratory exercises; attended by ninety students.

8. Geol. 2. A course in Physical Geography, by W. M. Davis. Second half-year. Two lectures a week, with recitations and laboratory exercises; attended by one hundred and ten students.

9. Geol. 20 *a*. A course in Advanced Meteorology and Physical Geography, by W. M. Davis. Weekly conferences; attended by six students.

10. Geol. 22. A course in Petrography, by J. E. Wolff. Two lectures a week, with laboratory work and theses; attended by six students.

11. Geol. 20 *d*. A course in Petrographic Investigation, by J. E. Wolff. Field and laboratory work; one student.

12. Geol. 25. A course in Mineral Veins and Metalliferous Deposits, by J. D. Whitney. First half-year. Two lectures a week; attended by twenty students.

During the winter season the students in the advanced classes attended regular evening meetings, which were designed to serve the purpose accomplished by the Seminaria of the German universities.

During the summer of 1891, forty-one students received instruction in the field. This instruction was given in three graded schools, one of which, the elementary school, was taught in Cambridge, and the other two in New York, New Jersey, and the New England States. Instruction in these courses was given by N. S. Shaler, W. M. Davis, J. E. Wolff, C. Cobb, and J. B. Woodworth, with the assistance of Prof. H. S. Williams of Cornell University, Prof. A. P. Brigham of Utica, N. Y., Prof. R. D. Salisbury of the University of Wisconsin, and Mr. C. W. Coman, Assistant, New Jersey Geological Survey, who collaborated with the other instructors in the work done in New York and New Jersey.

During the year, the following papers of a scientific nature have been published by N. S. Shaler: —

General Account of the Fresh Water Morasses of the United States, with a Description of the Dismal Swamp District of Virginia and North Carolina. Tenth Annual Report of Director of United States Geological Survey.

The Antiquity of the Last Glacial Period. Proceedings Boston Society of Natural History, Vol. XXV.

Individualism in Education. Atlantic Monthly, Vol. LXVII.

College Examinations. Atlantic Monthly, July, 1891.

Atlas of Massachusetts, fifty-five sheets quarto (with F. A. Walker and H. L. Whiting). January, 1891.

Report of the Massachusetts Topographical Survey Commission. January, 1891.

The instruction during the past year in the elementary courses in Physical Geography and Meteorology, by Professor W. M. Davis, has been greatly benefited by the occupation of the new rooms assigned to these subjects in the Geological Section of the Museum; and by the aid of Mr. R. DeC. Ward, of the class of 1889, who has acted as assistant in the laboratory work. Under these favorable conditions, it has been possible to introduce certain practical methods of laboratory teaching that have been in mind for several years past, but which have been unattainable heretofore in smaller rooms and without assistance. Each of these elementary courses occupied half a year, the number of students in the course on Meteorology being ninety, and in Physical Geography one hundred and ten. In each course, two lectures a week were given to the whole class in the large Lecture Room on the first floor; and an hour of laboratory work was arranged for each of the five sections into which the class was divided for this purpose, this work consisting of exercises on charts, maps, diagrams, models, photographs, etc., and involving about two hours' additional work by each student for its proper completion. In order to test the progress made by the class, it was divided into twelve sections, each of which met the instructor or the assistant weekly for a half-hour's recitation, followed by half an hour for a written exercise. Although the amount of time required for the work by the instructor and the assistant was great, it is believed to have been well expended, to the profit of the students: moreover, the marks assigned on the frequent recitations and written exercises, when combined at the end of the term, are found to be a valuable check on the mark given upon the final written examination.

The second course in Physical Geography and Meteorology, for students already acquainted with the rudiments of these subjects, was attended by six students. The work in this course is done individually by the students, and discussed in a weekly conference of two hours. The subjects studied in the past year were the Natural History of Rivers; the Physical Geography of Wisconsin; Professor Russell's Theory of Cold Waves; the Chinook Wind of the Rocky Mountains; and Faye's Theory of Cyclones. To this may be added a statement of the work in a similar course by three students of the Society for the Collegiate Instruction of Women, the subjects here studied being the Physical Geography of New York, of New Jersey, and of Pennsylvania.

The collections of the Laboratory of Physical Geography have been materially enlarged during the past year. A pair of projecting lanterns, purchased for the general use of the Geological Department, has greatly improved the means of illustration in the lectures; and a beginning has been made towards a series of geographical lantern slides. Especial effort is given to securing views characteristic of our own physical geography, at present very poorly represented in the collections of dealers. The laboratory collection has been added to by numerous gifts, of which the following may be mentioned: —

Photographs and slides of Rocky Mountain views, from F. H. Chapin, Esq., of Hartford, Conn.

Photographs of Saxon Switzerland, from Mr. R. DeC. Ward, of Cambridge.

Photographs of scenery on the Canadian Pacific Railway, from the Canadian Pacific Railway Company.

Photographs of scenery of the New York Central and Hudson River Railroad, from Hon. Chauncey M. Depew, President.

Photographs of Clouds, from Professor Riggenbach-Burckhardt, of Basel, Switzerland.

Photographs of Clouds, from Captain D. Wilson-Barker, of London, England.

Topographical Maps, from the United States Geological Survey.

The Laboratory collection will be soon extended by a number of important maps, already ordered from samples seen in the Geographical Exhibition of the Brooklyn Institute; and a considerable number of geographical text-books by various authors have already been secured in preparation for the proposed course for teachers, during the coming year.

The materials here named, as well as those accumulated during earlier years, are conveniently kept in the spacious Laboratory storeroom, where cases and shelves have been prepared for them. Among the most important of these materials is a complete set of the weather maps of the United States Signal Service, from the beginning of publication, for the most part in bound volumes, the gift of the Chief Signal Officer several years ago. This set is continued by the receipt of the current maps of the United States Weather Bureau.

The records and collections of the New England Meteorological Society are also kept in the Laboratory storeroom. Mr. J. Warren Smith, lately of the United States Signal Service, and now of the United States Weather Bureau, acting as assistant to the Society in its capacity as a local weather service for New England, has his office here.

During the winter, Mr. S. Ward Loper, of the United States Geological Survey, classified the fossil fish collected under the direction of Professor Davis from the Triassic formation of the Connecticut valley, and now temporarily placed in the Laboratory storeroom. An account of the results of this study has been published, as stated below.

The publications of Professor Davis during the year are as follows: —

Two Belts of Fossiliferous Black Shale in the Triassic Formation of Connecticut. By W. M. Davis and S. W. Loper. Bull. Geol. Soc. America, 1891, Vol. II. pp. 415–430.

Dr. Hann's Studies on Cyclones and Anticyclones. Science, Jan. 2, 1891, Vol. XVII. pp. 4–5.

The Geographical Exhibition of the Brooklyn Institute. The Nation, March 28, 1891, Vol. LII. p. 257.

Abstracts of Three Lectures delivered at Johns Hopkins University in January, 1891: Tornadoes, a Story of a Long Inheritance; The Physical Geography of Southern New England; The Triassic Sandstones of the Connecticut Valley. Johns Hopkins University Circulars, April, 1891.

European Weather Predictions. Amer. Met. Journ., June, 1891, Vol. VIII., pp. 53–58.

The Story of a Long Inheritance. Atlantic Monthly, July, 1891, Vol. LXVIII. pp. 68–78.

The Geological Dates of Origin of Certain Topographic Forms on the Atlantic Slope of the United States. Bull. Geol. Soc. America, 1891, Vol. II. pp. 541–586.

The instruction in Petrography was given by Dr. Wolff in the new Petrographical Laboratory of the University Museum. During the year the Lecture Room was fitted up for the microscopical projection of thin sections of rocks before the class. Six students attended the course through the year, and one student spent the year in original investigation.

The following papers were published during the year by Dr. Wolff:—

On the Lower Cambrian Age of the Stockbridge Limestone at Rutland, Vt. Bull. Geol. Soc. America.

On the Metamorphism of Clastic Feldspar in Conglomerate Schist. Bull. Mus. Comp. Zoölogy.

An investigation of some akmite trachytes from the Crazy Mountains, Montana, was completed by Mr. R. S. Tarr and Dr. Wolff (not yet published), and on other rocks of that range and of New England. In the spring, the instructor began the field and laboratory investigation of the Archæan Highlands of New Jersey and New York, in connection with the United States Geological Survey.

REPORT ON THE INSTRUCTION IN ZOÖLOGY.

By Professor E. L. Mark.

Since the last report, courses of instruction in Zoölogy have been somewhat rearranged. Corresponding to alterations in the organization of the Faculty of Arts and Sciences, there has been a change in the announcement of the courses, so that those previously designated as courses in Natural History are now named, from their respective departments, Botany 1, 2, etc., and Zoölogy 1, 2, etc. This has allowed a more natural sequence of the courses announced in Zoölogy, which with their previous equivalents are as follows: —

Zoölogy	1,	formerly	Nat. Hist.	2.
"	2,	"	"	5 (the Zoölogical half).
"	3,	"	"	6.
"	4,	"	"	13.
"	5,	a new course.		
"	10,	formerly	Nat. Hist.	21.
"	20 *a*,	"	"	9.
"	20 *b*,	"	"	10.

With the exception of a new half-year course (Zoöl. 5), the lectures were substantially the same as those in 1889–90 and were given by the same instructors.

Ninety-one students completed the course in Zoölogy 1. The Assistants were Mr. William E. Ritter, upon whom the most of the laboratory work devolved, and Mr. J. C. Hubbard.

Zoölogy 2 was conducted as heretofore in the second half of the year by Mr. G. H. Parker, and his Assistant in the laboratory work was again Dr. W. A. Setchell. There were thirty-four students in this course.

The course on the Comparative Anatomy of Vertebrates (Zoöl. 3) was also given by Mr. Parker to twenty students.

There were nine students in Zoölogy 4, which covered about the same ground as in the previous year. Mr. W. M. Woodworth had charge of the laboratory work, and he also gratuitously assisted the instructor in connection with the laboratory work of Zoölogy 5. The latter course extended through the second half of the year, and was taken by nine students. The lectures, on the Embryology of Vertebrates, were accompanied by laboratory work on the development of the Chick.

There were eight persons, all Graduates, engaged in special researches (Zoöl. 20 *a*), as large a number as the Laboratory designed for this purpose will accommodate. All the students in this work made satisfactory progress with their investigations; at the last Commencement two of them received the degree of Ph. D., one the degree of S. D., and one the degree of A. M.

The following table shows the numbers and sources of the students in Zoölogical courses: —

Class.	Gr.	Sen.	Jun.	So.	Fr.	Sp.	Sc.	Total.
Zoöl. 1	3	12	9	21	21	18	7	91
" 2	1	9	4	12	3	1	4	34
" 3	4	7	6	..	..	..	3	20
" 4	5	..	1	..	..	..	3	9
" 5	6	..	1	..	..	..	2	9
" 10	..	3	1	..	..	..	..	4
" 20 *a*	8	..	..	..	..	..	..	8

The removal of Professor Farlow's Laboratory and the Cryptogamic Herbarium to the new Botanical section of the University Museum has added a large room to the Zoölogical Laboratories. By assigning this new room to the less advanced students in microscopic work, it has been possible to relieve the overcrowded condition of the room designed for students working on advanced subjects.

The meetings of the Zoölogical Club have been well attended during the year.

During the past year the following Contributions from the Zoölogical Laboratory, under Dr. Mark, have been published, all except No. XXIII. in the Museum Bulletin: —

XIX. Cristatella: the Origin and Development of the Individual in the Colony. By C. B. Davenport. 52 pp., 11 pls. November, 1890.

XX. The Eyes in Blind Crayfishes. By G. H. Parker. 10 pp., 1 pl. November, 1890.

XXI. The Origin and Development of the Central Nervous System of Limax maximus. By Annie P. Henchman. 40 pp., 10 pls. December, 1890. — This paper was the result of work done at the Museum by Miss Henchman while a student in the "Harvard Annex."

XXII. The Parietal Eye in some Lizards from the Western United States. By W. E. Ritter. 20 pp., 4 pls. January, 1891.

XXIII. Preliminary Notice on Budding in Bryozoa. By C. B. Davenport. Proc. Amer. Acad. Arts and Sci., Vol. XXV. [1890]. 5 pp. 1891.

XXIV. Contributions to the Morphology of Turbellaria. — I. On the Structure of Phagocata gracilis, Leidy. By W. M. Woodworth. 44 pp., 4 pls. April, 1891. — This paper was presented as a thesis for Ph. D.

XXV. The Compound Eyes of Crustacea. By G. H. Parker. 98 pp., 10 pls. May, 1891. — Presented as a thesis for S. D.

XXVI. On some Points in the Anatomy and Histology of Sipunculus nudus, L. By Henry B. Ward. 42 pp., 3 pls. May, 1891.

XXVII. The Development of the Pronephros and Segmental Duct in Amphibia. By Herbert H. Field. 142 pp., 8 pls. June, 1891. — Presented as a thesis for Ph. D.

The plates are printed for papers by Mr. Davenport, "Observations on Budding in Paludicella and some other Bryozoa," — now in press, — and by Mr. Frank Smith, "Gastrulation of Aurelia flavidula, Pér. & Les." The papers by Mr. Smith and Mr. H. P. Johnson are ready for the printer, and Mr. Boyer's paper is to be forwarded soon.

The greatest need of the Zoölogical Laboratories at present is the equipment of the Aquarium and Vivarium, to which the Curator called attention in former Reports. It is to be regretted that the department has been so long deprived of this essential accessory to zoölogical work.

REPORT ON THE OSTEOLOGICAL DEPARTMENT.

By D. D. Slade.

Several valuable additions have been made to the collection since the last Report. Among the articulated skeletons, mention should be made of the fine specimens of Balæna cisarctica, Physeter macrocephalus, and Monodon monoceros, all of which have been suspended in the main Exhibition Hall. The extreme rarity of the Chlamydophoridæ among the Edentata renders the recent possession of C. truncatus a most valuable acquisition. The disarticulated skeletons also comprise several of much interest to the scientist and student. The entire collection is in good order and preservation, and, while extremely valuable, is still sadly deficient in many of the orders. Attempts have been made by the Assistant, during the last few months, to induce some of the wealthy friends of the University to contribute to a fund for the care and increase of the collection, than which none can be more useful and important in the pursuit of a scientific education. Although not so successful as he could wish, perseverance may produce good results in the near future.

Instruction has been given in Comparative Osteology during the past year by means of lectures, laboratory work, and by frequent examinations. The course has been attended by three Seniors and by one Junior.

While this course, Zoölogy 10, is usually selected by those who have the medical profession in view, it presents rare opportunities for special study and research, both to the graduate and undergraduate.

The following papers have been published during the year: —

The Significance of the Jugal Arch. Science, Vol. XVI. p. 332.

The Jugal Arch in the Primates. Science, Vol. XVII. p. 317, and Vol. XVIII. p. 53.

On the Genus Chlamydophorus. American Naturalist, June, 1891, p. 540.

MAMMALS AND BIRDS.

Mr. Brewster has nothing of special interest to report in regard to the Mammals and Birds during the past year. He has been for some time in correspondence with collectors to bring together birds from the islands of the Pacific for our Pacific Faunal Room. He has published the following papers since the appearance of the last Annual Report.

In "The Auk": —

"Summer Robin Roosts."

"A New Subspecies of the Solitary Sandpiper."

"Breeding of the Pileated Woodpecker in Worcester County, Massachusetts."

"A Study of Florida Gallinules, with some Notes on a Nest found at Cambridge, Massachusetts."

"Notes on the Birds of the Lower Suwanee River." (By William Brewster and F. M. Chapman.)

"Descriptions of Seven supposed new North American Birds."

"Notes on Bachman's Warbler (*Helminthophila Bachmani*)."

"The Whistling Swan in Massachusetts."

"*Megascops asio Macfarlanei*, — a Correction."

In "Forest and Stream": —

Two notes without formal titles, both relating to the whistling sounds made by the American Woodcock while flying.

REPORT ON THE REPTILES AND FISHES.

By Samuel Garman.

Contributions to the collections in this department have been made by Mr. H. L. Shumway, Dr. G. O. Rogers, Mr. J. E. Hall, Dr. W. M. Haines, Prof. Walter Faxon, Mr. A. N. Cheney, Mr. Eugène A. Browne, Mr. J. H. Blake, Miss I. Batchelder, and Prof. Alexander Agassiz. In that made by Dr. Rogers, received through the kindness of Prof. F. W. Putnam, there were a number of very desirable Reptiles and Batrachians from Central Mexico.

Among the exchanges sent us there was a valuable series of deep-sea types, secured by the French Government Expeditions in the "Travailleur" and the "Talisman," forwarded by Prof. Leon Vaillant from the Paris Museum. Another series of species from the Kara Sea was received from Prof. Chr. Lütken, of the Copenhagen Museum; and various Reptiles and Batrachians were sent us by Dr. George Baur and Mr. A. L. Babcock.

By purchase, a number of choice representatives of West Indian, African, and Australian species were obtained from the Linnæa Naturhistorisches Institut.

The outgoing exchanges were a comprehensive series of the South American Siluroids to Dr. K. Kraepelin, of the Naturhistorisches Museum zu Hamburg; another to Prof. C. H. Eigenmann, of Indiana University; a lot of Deep-sea Fishes to Prof. R. Collett, of Christiania, Norway; and others to Dr. George Baur, of Clark University.

In connection with the continued preparations for the Exhibition Rooms, certain Selachians, Reptiles, and Fishes have been sent to Professor Ward for mounting. The condition of the collections as a whole has been much improved; the waste from evaporation or other causes has been comparatively small, and the number of identified species from which exchanges may be made has been considerably increased.

The publications from this department include the following, besides unsigned reviews and notices of works on related subjects.

In the Bulletin of the Essex Institute: —

"On a Genus and Species of the Characines (*Henochilus Wheatlandii*, gen. n. et sp. n.)."
"On Balistes vetula."
"Silurus (Parasilurus) Aristotelis."
"The Gila Monster (*Heloderma suspectum*)."
"On a Tortoise found in Florida and Cuba."

In the Twenty-fifth Annual Report of the Commissioners on Inland Fisheries of Massachusetts: —

"Massachusetts Carp."
"The River or Brown Trout."
"New England Saibling."

In "The Nation": —

"The Blizzard Fossils."

In "Forest and Stream": —

"The Golden Trout."

In the "American Angler," and in "Shooting and Fishing": —

"The Alpine Trout."
"The Freshwater Salmon."
"Salmo alpinus, 1758 — S. aureolus, 1888."
"Nova Scotian Salmon."
"The Sunapee Saibling."
"A new Trout from Maine."
"The Sunapee Trout (*Salmo alpinus*)."

CRUSTACEA.

THE only items of importance mentioned by Professor Faxon in regard to the Crustacea are the accessions received from Mr. Charles Chilton from New Zealand, and the Crustacea of the Dijmphna Expedition, presented to the Museum by the Director of the Zoölogical Museum of the University of Copenhagen. A few dried Crustacea have also been purchased from Ward for our Exhibition Rooms.

REPORT ON THE PALÆONTOLOGICAL DEPARTMENT.

By Alpheus Hyatt.

The work of the past year has been marked by a notable advance towards completion of the general arrangement of the Invertebrates. With the exception of certain small collections of Permian and Triassic Fossils in Room C which still remain undivided, and a collection of slabs and undeveloped materials which have been placed in cases reserved for such purposes in Room A, the larger part of all the fossils of each class have been brought together in the following order: the Protozoa, Sponges, Hydroids, Corals, and Echinoderms in Room A; the Worms, Bryozoa, Brachiopods, Insects, Crustacea, and Trilobites in Room B; the Lamellibranchs, Pteropods, and the larger part of the Gasteropods in Room C; and the remaining Gasteropods and all the Cephalopods in Room D. There still remain, in all of the collections which have not been carefully gone over specimen by specimen, a considerable proportion of misplaced fossils, which can only be weeded out by very close work. This is the case especially in those collections, such as the Schary, Dyer, Day, and others, which contain considerable amounts of unnamed specimens. During the progress of this revision, a large number of choice Fossils suitable for exhibition in the Stratigraphic Collection were picked out and marked with appropriate labels. Although the separation of the classes into genera has made considerable progress in past years, and in some classes may be said to be well advanced, it is hopeless to expect to complete this for any one of these natural divisions until the general arrangement has been practically finished.

This work, and that of picking out specimens for exhibition in the Stratigraphic Collection, can now be continued with much greater facility. Blue print maps are hung in each room giving floor plans with the cases in white, and upon these the number of each case is given and brief abstracts of its contents. Each case has an outside label hanging to the knob of the sash giving a number and a synopsis of the contents, so that any material may be as quickly found as is practicable in the present condition of the collections. This system admits of constant alteration and replacement of maps and labels as the arrangement progresses, an obvious advantage which does not need explanation.

The Assistant has finished the systematic collection of Cephalopods on exhibition, and a full presentation of the genera has been given. The collections contain a very large proportion of the original types of all the genera yet described in this class, and of the remaining genera good examples of all except a few recently published in Europe. This exhibition is therefore probably the most complete now in existence as an exposition of the range of natural modifications in this important class of Fossils.

The Sponges, Hydroids, and Echinoderms have been more or less worked upon for the purpose of getting together all of the forms in each genus, thus preparing the way for the permanent arrangement and the final selection and naming of specimens for exhibition. Some of the more important families of the Lamellibranchs in the Jura and Cretaceous have been similarly treated, and are almost completed.

By the kind permission of Alexander Agassiz, Director, the extensive foreign collections in the Trias and Jura of the Museum have been placed at my disposal for the study and comparison of our American species with the typical European forms. The great advantages thus gained will be appreciated by all professional palæontologists, especially those engaged in similar work, but obliged to rely solely upon foreign publications. These collections will require considerable time to bring them into proper shape for this purpose, since much of the material has been acquired in separate lots from different collectors, and needs to be concentrated and arranged. This work has been begun and an appreciable advance made during the past year.

Besides efficient services in connection with the general arrangement and superintendence of the removal and placing of fossils, the department is indebted to Dr. R. T. Jackson for a large amount of work in the revision of the Mollusca, Corals, and Brachiopods, which contained unarranged material and considerable special work upon some smaller groups.

Miss Clark has been employed in preparing labels, and dusting and remounting specimens. It became necessary to remount a very large number of the specimens in the older parts of the collections which had been glued to card boards. These were in no danger of being lost or materially damaged, but had cracked off and were lying loose in the trays. It is probable, in consequence of the more durable glue now used and the fact that the trays have reached their final destination in the Museum, that this work will not require to be done over again.

The following papers were published during the year by the assistants in this department: —

Guides for Science Teaching, No. VIII. Insecta, by Alpheus Hyatt and J. M. Arms. 323 pages, illustrated by 223 figures. D. C. Heath & Co., Boston, 1890.

The Next Stage in the Development of Public Parks. By Alpheus Hyatt. Atlantic Monthly, February, 1891.

Dall on Dynamical Influences in Evolution. By R. T. Jackson. Am. Nat., October, 1890.

Studies of Pelecypoda. By Robert Tracy Jackson. Am. Nat., December, 1890, p. 1132.

The Mechanical Origin of Structure in Pelecypods. Am. Nat., January, 1891, p. 11.

REPORT ON THE LIBRARY.

By Miss F. M. Slack.

During the year ending September 1, 1891, the Library has received 705 volumes, of which 57 are atlases, 1,998 parts, and 147 pamphlets: —

	VOLUMES.	PARTS.	PAMPHLETS
Gift	8	48	20
Exchange	212	854	84
Purchase	78	240	10
A. Agassiz	66	841	31
Binding Parts	254		
Whitney Library	87	20	2
	705	1998	147

The number of volumes now in the Library (exclusive of pamphlets and the greater part of the Whitney Library) is 19,807. There are 13,281 pamphlets bound in 2,182 volumes, making the total number of volumes 21,989.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE ACADEMIC YEAR 1890–91.

Of the Bulletin.

Vol. XX. [Complete.]

No. 2. On the Rate of GROWTH OF CORALS. By A. AGASSIZ. pp. 4. 4 Plates. August, 1890.

No. 3. Preliminary Account of the FOSSIL MAMMALS from the White River and Loup Fork Formations. Part II. CARNIVORA and ARTIODACTYLA, by W. B. SCOTT. PERISSODACTYLA, by H. F. OSBORN. pp. 36. 3 Plates. November, 1890.

No. 4. Contributions from the Zoölogical Laboratory. — XIX. CRISTATELLA: the Origin and Development of the Individual in the Colony. By C. B. DAVENPORT. pp. 52. 11 Plates. November, 1890.

No. 5. Contributions from the Zoölogical Laboratory. — XX. The EYES in BLIND CRAYFISHES. By G. H. Parker. pp. 12. 1 Plate. November, 1890.

No. 6. Notice of CALAMOCRINUS DIOMEDÆ, a New Stalked Crinoid from the Galapagos, dredged by the U. S. Fish Commission Steamer "Albatross." By A. AGASSIZ. pp. 4. December, 1890.

No. 7. Contributions from the Zoölogical Laboratory. — XXI. The Origin and Development of the CENTRAL NERVOUS SYSTEM in LIMAX MAXIMUS. By ANNIE P. HENCHMAN. pp. 40. 10 Plates. December, 1890.

No. 8. Contributions from the Zoölogical Laboratory. — XXII. The PARIETAL EYE in some LIZARDS from the Western United States. By W. E. RITTER. pp. 20. 4 Plates. January, 1891.

Vol. XXI. [Complete.]

No. 1. Contributions from the Zoölogical Laboratory. — XXIV. Contributions to the Morphology of the TURBELLARIA. I. On the Structure of PHAGOCATA GRACILIS, Leidy. By W. M. WOODWORTH. pp. 44. 4 Plates. April, 1891.

No. 2. Contributions from the Zoölogical Laboratory. — XXV. The COMPOUND EYES in CRUSTACEANS. By G. H. PARKER. pp. 98. 10 Plates. May, 1891.

No. 3. Contributions from the Zoölogical Laboratory. — XXVI. On some Points in the Morphology and Histology of SIPUNCULUS NUDUS, L. By H. B. WARD. pp. 42. 3 Plates. May, 1891.

No. 4. THREE LETTERS from ALEXANDER AGASSIZ to the Hon. Marshall McDonald, on the DREDGING OPERATIONS off the West Coast of Central America to the Galapagos, to the West Coast of Mexico, and in the Gulf of California, carried on by the U. S. Fish Commission Steamer "Albatross." pp. 16. June, 1891.

No. 5. Contributions from the Zoölogical Laboratory. — XXVII. The Development of the PRONEPHROS and SEGMENTAL DUCT in AMPHIBIA. By H. H. FIELD. pp. 140. 8 Plates. June [August], 1891.

[B]

INVESTED FUNDS OF THE MUSEUM.

In the hands of the Treasurer of Harvard College, Sept. 1, 1890.

Sturgis-Hooper Fund	$100,000.00
Gray Fund	50,000.00
Agassiz Memorial Fund	297,938.10
Teachers and Pupils Fund	7,594.01
Permanent Fund	117,469.34
Humboldt Fund	7,740.66
	$580,737.11

The payments on account of the Museum are made by the Bursar of Harvard College, on Vouchers approved by the Curator. The accounts are annually examined by a committee of the Museum Faculty. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts with vouchers to the payment of which the income is applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Humboldt Fund can be applied for the benefit of one or more students of Natural History, either at the Museum, the Newport Marine Laboratory, the United States Fish Commission Station at Wood's Holl, or elsewhere.

Applications for the Tables reserved for advanced students at the Newport Marine Laboratory, and for the Tables at the Wood's Holl Station, should be made to the Curator of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

Mus. 120.20.6.1

With the Compliments of

ALEXANDER AGASSIZ.

ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE,

FOR

1891–92.

CAMBRIDGE, U.S.A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1892.

Case .... *Shelf* ....

LIBRARY

OF THE

Peabody Museum of American Archæology and Ethnology

IN CONNECTION WITH HARVARD UNIVERSITY.

PRESENTED BY

A. Agassiz

Received Jan. 1893.

Cambridge, Muse

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FACULTY OF THE MUSEUM.

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ALEXANDER AGASSIZ, *Curator.* GEORGE L. GOODALE.
JOSIAH D. WHITNEY, *Secretary.* HENRY P. WALCOTT.

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NATHANIEL S. SHALER	*Professor of Geology.*
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WALTER FAXON	*Assistant in Zoölogy in charge of Invertebrates.*
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GEORGE E. LADD	*Assistant in the Geological Laboratories.*
ROBERT DeCOURCEY WARD	*Assistant in the Geographical Laboratory.*
H. LANDES	*Assistant in the Geographical Laboratory.*
CHARLES L. WHITLE	*Assistant in the Petrographical Laboratory.*

REPORT.

To the President and Fellows of Harvard College:—

During the past year the usual courses of instruction have been given at the Museums in Zoölogy by Professor Mark, Dr. Slade, and Mr. Davenport, assisted in the Laboratory work by Messrs. W. M. Woodworth, W. S. Nickerson, J. C. Hubbard, and H. M. Kelly.

Professors Whitney, Shaler, Davis, and Wolff gave courses of instruction in Geology, Palæontology, Physical Geography, and Petrography. Messrs. Harris, Dodge, Kummel, J. B. Woodworth, R. DeC. Ward, Westgate, and R. T. Jackson were the Assistants in the Undergraduate instruction of the Geological Department.

For the details of these courses of instruction, as well as of the summer courses in Geology, I would refer to the accompanying special reports of the Professors and Instructors.

The Reports upon the instruction given in Natural History at the Museum show how little of the work of our Professors is devoted to fostering original research or advanced studies. The fact is, that the Undergraduate classes have become so large, and their demands upon the time of the Professors so pressing, that the function of the latter of encouraging, as University Professors, the attendance of advanced students at Harvard is reduced to a minimum. In fact, the time which our Professors give to elementary teaching is entirely out of proportion to that allowed them for higher instruction. Thus the facilities for original investigation which might be attained at the Museum, and for which it was primarily intended, have been thrown away for many years, owing to the inability of the authorities to appoint men whose duties should lie in this direction.

For more than twenty years it has been my aim gradually to provide room and materials for such a purpose, and it is not encouraging to find that the time and means thus spent have been so unproductive of better results.

It is not the province of the Museum to provide the necessary instructors, — that belongs to the University; but it is time that the authorities of the Museum should protest against the ascendency of the Undergraduate instruction, which threatens to overcome the higher purposes of the institution, and to render it comparatively useless for the progress of science and for the more advanced studies. It is time that the original aim of the Museum should be reasserted, and its highest usefulness be made available. The appointment by the University of half a dozen men to the Natural History Department, to carry on original investigation themselves, and to direct the work of advanced students, would go far towards placing the Museum on a more active plane. We need teachers in Entomology, in Vertebrate and Invertebrate Zoölogy and Palæontology, as well as in Marine Zoölogy; additional assistants to the Professors and Instructors already teaching are needed to fill the gaps in our advanced instruction. One of the first requisites in carrying out such plans is the removal of the Undergraduate instruction to a new part of the University Museum, the space for which remains in the vacant southwest corner of the Oxford Street façade of the Museum.

It is a surprise to me to find how little seems to be known in this country regarding the publications of the Museum, and the facilities for teaching in our Natural History Laboratories. In a recent circular of information issued by the Bureau of Education,[1] the account given of the Museum Laboratories is very unsatisfactory. This, however, is explained from the unscientific method of preparation of the circular. Our Annual Reports have evidently not been consulted, and the mere sending out of circulars and blanks to be filled up can never supply the requisite data for the compilation of an authoritative report such as this circular purports to be. The author who supposes that such loose methods of obtaining information can take the place of careful reference to official reports, or of personal acquaintance with a subject, shows his ignorance of the most rudimentary principles of attacking a scientific problem.

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[1] Bureau of Education Circular of Information No. 9, 1891. Biological Teaching in the Colleges of the United States, by John P. Campbell, A. B., Ph. D. (Johns Hopkins), Professor of Biology in the University of Georgia. Washington, Government Printing Office, 1891.

Considerable correspondence has taken place with the officials of the Educational Exhibits and of the Fishery Exhibits of the Columbian Exposition in regard to a representation of the Museum at Chicago. Instructing as it might be to the public to send photographs and a description of the institution as it now stands, this would entail a very considerable outlay both of time and money, neither of which is at the disposal of the officers of the Museum for such a purpose.

The Newport Marine Laboratory has, as usual, been placed at the disposal of the advanced students in Zoölogy, and its tables have been occupied by Messrs. Davenport, Ward, Kelly, Kofoid, Mayer, Weysse, Lucas, Woodworth, and Gerould, who were occupied during their stay in collecting material for their special investigations. The work of the students was principally devoted to the embryology of Mollusks, of Acalephs, and of Echinoderms. Mr. Woodworth was kind enough in my absence to put the Laboratory in working order for the opening of the season.

We have to thank Colonel Marshall McDonald, United States Fish Commissioner, for facilities granted our students in connection with their work at the Fish Commission Station at Wood's Holl.

In connection with the Newport Laboratory, it is a pleasure to me to report that the Museum has received from Major Theodore K. Gibbs, of Newport, the sum of five thousand dollars to establish the Virginia Barret Gibbs Scholarship Fund, the income of which is to be devoted to assisting students interested in the study of Marine Zoölogy. The conditions which regulate the use of the income of this Scholarship are similar to those of the Tyndall Fellowship, and are given in Appendix B to this Report.

But little change has taken place in any of the Exhibition Rooms now open to the public. The model of the East Coast of the United States has been placed in the Geographical Room, but unfortunately we have been unable to make any progress in its final arrangement, or in that of the Geological Exhibition Room. Extensive changes have been undertaken in the North American Faunal Room to accommodate the Greene Smith Collection of Birds.

We have continued to fill a few of the gaps existing in our collections by purchases, mainly from Ward. Our greatest desiderata are now in the African Room, where we should have, in order to make the collection more characteristic, a good Hippopotamus, a Giraffe, and a few additional Antelopes. We have devoted one of the wall cases of that room to the Fauna of Madagascar. All the Lemurs and other characteristic Madagascar Mammals, as well as the few Madagascar Birds formerly in our African Faunal Collection, have now been placed in the cases devoted to the Fauna of Madagascar. It is astonishing to see how the peculiar mammalian fauna of that island gains in distinctness, now that it is separated from its African surroundings. This and the Australian faunal exhibits show at a glance the value of such an arrangement in our Museum.

The rooms containing the Quaternary Pampas Vertebrate Fossils, and a few Tertiary Mammals, are now open to the public. No more interesting exhibit could be made than by supplementing what has already been placed on exhibition with a series of our North American Fossil Vertebrates.

The collections of the Museum continue in good condition. I regret that Dr. Hagen's prolonged ill-health has made it impossible for him to attend to his usual duties at the Museum. Owing to our insufficient means, we have been unable to continue Professor Hyatt's salary at the Museum. He has, however, kindly consented to keep a general supervision over the palæontological collections, which of course suffer less from want of attention than our more perishable zoölogical material. It has been found necessary to give more care to the latter, and Professor Walter Faxon has been placed in charge of the Invertebrate collections.

Professor Edmond Perrier has returned the Starfishes of the "Blake" which had been sent to him for examination, and has at the same time presented to the Museum, in behalf of the Jardin des Plantes, an extensive series of the Starfishes of the "Talisman" expedition, types of the species described by him.

Professor Alphonse Milne-Edwards has now returned the "Blake" Crustacea, with the exception of the Galatheoids, which he has kept for comparison while working up the Crustacea of the "Talisman."

Professor Verrill still has in his possession the Alcyonoids of the "Blake" expedition, and reports fair progress in their determination; he also reports that Miss Bush's paper on the Northern Atlantic Mollusks collected by the "Blake" during the expedition of 1880 is nearly ready for publication.

Professor Milne-Edwards's Memoir on the Paguridæ of the "Blake" is now in press. The plates have been completed, and we hope to publish it early this winter.

Considerable progress has also been made in the press-work of the Special Bulletin No. 2 of the National Museum, which will contain the Deep-sea Fishes of the "Blake," by Professor Goode and Dr. Bean.

We have received during the year an anonymous contribution, to be applied to the increase of Dr. Hagen's salary. The Corporation have kindly consented to assume a part of Dr. Hagen's salary, and charge it upon the retiring allowance fund. This has enabled me to engage Mr. Samuel Henshaw to devote some time to the care of the collection, and to superintend its use by specialists.

Among the principal additions to our collections I may mention two skins of the Wingless Rail from the Sandwich Islands, presented by the Hon. S. B. Dole of Honolulu; also, by purchase, a small collection of the principal birds of the Hawaian group, intended for the Pacific Exhibition Room.

From Ward we have obtained a magnificent alligator for the North American Room.

We have to thank Mr. Charles Wachsmuth for a number of interesting Fossil Crinoids.

The fine Rhytina skeleton presented to us by the Smithsonian Institution has been mounted by Ward and placed in the Pacific Room. We have also received from the National Museum a cast of the well known Trilobite, with its appendages, described by Mr. C. D. Walcott; and from Mr. N. P. Miller, a collection of Starfishes from Alaska. Professor Mitsukuri of the Imperial University of Tokio has presented a fine Metacrinus, and a Hyalonema from off Misaka, as well as specimens of Astacus and of the Ditrema so common in Japanese waters. From a comparison of this viviparous perch with our Californian Embiotocoid I find that it corresponds to the American genus Micrometrus of Gibbons.

Since the Hume Collection of Indian Birds was presented to the Museum we have not received from any quarter so valuable an addition to our stock as the Collection of North American Birds presented to the Museum by Mrs. Greene Smith, of Peterborough, N. Y. The terms upon which the collection has been given to the Museum are most liberal, and while the collection will remain intact as the Greene Smith Collection, it will at the same time form the bulk of our collection of North American Birds, just as the Hume Collection practically forms the Bird Collection of the Indian Room. The Greene Smith Collection is well known to ornithologists as perhaps the most complete and best mounted collection of North American Birds brought together by a private individual. The Museum is fortunate in being chosen by Mrs. Smith as the recipient of so valuable a collection, and we have to thank her most cordially for the liberal conditions which she attaches to the gift. (See Appendix C.)

We have to thank the Swiss Confederation for sending us, through the Polytechnicum, a large number of topographical maps published by that government.

We owe to Mr. Binney the plates which accompany the last Supplement to his North American Land Shells, published in the Museum Bulletin.

The Museum has sent to Dr. Dall for examination a small collection of Tertiary Fossils from the Isthmus of Panama, sent us by Mr. F. Sousa.

The remainder of our collection of Bats has been forwarded to the Marquis Doria, at Genoa, for examination.

We have also sent out for examination small collections of Reptiles, of Sharks, and of Fishes to Messrs. Goode and Bean.

A number of Crinoids have been sent to Mr. Wachsmuth for comparison.

A number of European geologists, who attended the International Congress of Geologists held at Washington last year, visited the Museum, and examined, as far as practicable, some of the special collections in which they were interested.

That part of the collections of the "Albatross" expedition of 1891 which is to be worked up at Cambridge has been received in excellent condition, with the exception of the Acalephs, which I fear will hardly give me the material I hoped to have at my disposal when the collections were made. Mr. Westergren, the artist who accompanied me on the "Albatross," is now at work at the Museum, and has completed a number of the plates intended to illustrate the monograph of Mr. Faxon on the Crustacea of the expedition. He will next devote his time to the Fishes and the Echini.

With few exceptions, the remaining collections are now in the hands of the specialists who have kindly consented to work them up. Short preliminary reports are already under way to illustrate the more novel types. Among them is a notice by Professor Ludwig of some interesting Holothurians, with sketches of the species in their natural attitudes, from drawings made on board by Mr. Westergren and myself. Professor Ludwig also informs me that he has already finished the descriptive text of three families, and that a number of plates of Holothurians are well under way. Dr. Goës has finished a notice of the gigantic Foraminifer mentioned in my Preliminary Report, and described by him as a new genus (Neusina). Both these papers will shortly be published.

Preliminary reports have also been made to Colonel McDonald, the United States Fish Commissioner, by Mr. Ridgway, on the Birds of the Galapagos, and on the small collection of Insects by Dr. Riley.

Colonel McDonald has shown the greatest interest in the collections of the "Albatross," and has given me his cordial co-operation in their final distribution. He assigned to Mr. Richard Rathbun the care of the large collections on their arrival at Washington, and the cordial thanks of the naturalists who are to work up this valuable material are due to him for the thorough manner in which he has accomplished the laborious and thankless task of forwarding from Washington to their destinations the different collections, with the consent of the Fish Commissioner.

I have myself published in the Museum Bulletin a preliminary account of the "Albatross" expedition, and have described in the Memoirs the interesting Stalked Crinoid, Calamocrinus, discovered by the "Albatross" off the Galapagos.

We have also received from Captain Tanner of the "Albatross" an interesting collection from intermediate depths from the surface to three hundred fathoms, made with the Tanner tow-net in 1892, during the exploration for a telegraphic cable from California to the Sandwich Islands. A preliminary examination of the material apparently confirms the views expressed in my preliminary report of the "Albatross" expedition regarding the bathymetrical distribution of pelagic life.

The Comatulæ of the "Blake," which were in the hands of the late Dr. P. H. Carpenter, have been sent to Dr. Hartlaub of Göttingen, who will work them up in connection with those of the "Albatross." I have to thank Mr. Percy Sladen for the trouble he has taken in making the transfer to Dr. Hartlaub.

I consider myself most fortunate in having the opportunity to take charge of the publications of so interesting an expedition as that of the "Albatross" in 1891. I am sure that I represent the views of scientific men in expressing a regret that so little has thus far been published in connection with the Fish Commission work regarding the marine fauna of the east coast of the United States, considering the splendid opportunities which have been supplied. It seems strange that Congress should not have made liberal appropriations for the working up by specialists of the magnificent collections brought together during so many years by the vessels of the Fish Commission.

A collection of Deep-sea Echini and Ophiurans, from the various deep-sea explorations sent out under the auspices of the Coast Survey, has been sent to the British Museum, in exchange for similar material given to the Museum by the "Challenger" expedition.

Appendix A of this Report contains a list of the publications of the Museum issued during the past academic year. We have published four numbers of the Bulletin, forming Volume XXII. of the series, and three numbers of the twenty-third volume. Of the quarto Memoirs two numbers have been published. The independent publications of the gentlemen connected with the Museum will be found enumerated with their reports. The Library continues to increase, and our exchange list is on a most satisfactory footing.

I give herewith plans and different views of the Newport Marine Laboratory, showing its present condition. The Laboratory was fully described in my Report of 1876–77. Its efficiency has been increased by the addition, on the second floor, of a photographic room and microphotographic apparatus. An additional room of considerable size has also been attached to the building, to be used as a library and a private laboratory for myself. The unit adopted for the working space of each individual has been slightly increased in the new room, and as now planned it will be a simple proposition to erect a new Laboratory for general purposes and for special investigation by adopting the dimensions now in use for each table.

As it has gradually become apparent that each institution will eventually wish to control its own Marine Laboratory, and that no co-operation is possible between the different Universities, it has occurred to me that some expansion of the Newport Marine Laboratory might meet the demands of Harvard University. I would here say that various attempts have been made at such co-operation without success. At the time the Anderson School was abandoned, an appeal was made to the Colleges throughout the country to establish a central zoölogical station, but it received no encouragement. A second attempt was made, in connection with the late Professor Baird, to interest the Natural History departments of the larger Universities in supporting a laboratory for research at Wood's Holl in connection with that of the Fish Commission. This likewise failed. Since then the independent action of the Johns Hopkins University, of the University of Pennsylvania, of the University of California, of the Leland Stanford Jr. University, and of others, confirms the impression that every such institution is to have its own establishment for modern zoölogical research.

But if a central laboratory is no longer to be thought of, it may be practicable to form an international association of marine laboratories, the members of which will exchange the facilities each may possess, so that all may share in the advantages of position as regards special opportunities for investigation at the different stations. Or it might be that with the help of such joint action an association might be formed for the establishment of a marine laboratory within the tropics in the vicinity of a coral reef. While many such schemes loom up as possibilities, in view of the increased interest in this kind of research, the more immediate and important question is whether Harvard, like other Universities, shall have a marine laboratory to facilitate the research of her own students.

Towards this something might be done in the near neighborhood of my own laboratory at Newport, if the necessary means can be raised. In some form or other, I have had this in mind since 1876, when the Marine Laboratory at Newport was opened, to which a certain number of the more advanced students of Harvard University were regularly invited. In doing this, I had always hoped that the time might come for joining with other institutions in establishing a more general laboratory for research. Such a plan has become impracticable, as we have seen ; but it still seems to me that if Harvard is to have a marine laboratory of her own, the conditions at Newport are very favorable.

I would therefore propose that whenever sufficient means can be obtained a large Laboratory for research should be built on the east side of the cove on which my own Laboratory is placed, and that a dwelling-house for the use of students be erected on a suitable lot in the immediate vicinity. A large sea-going launch, suitable for dredging within fifty to seventy-five miles from Newport, is also needed, to give better collecting facilities than we have had before, and to supply larger material for the work of the Laboratory.

Until this shall be accomplished, a certain number of advanced students will continue to make use, as hitherto, of the limited room and facilities afforded by the existing Laboratory. But it is evident that whatever can be offered will only be an adjunct as it were of the larger establishment which must soon be necessary if Harvard is to keep pace with sister Universities in this department of study.

For the less advanced students it would be necessary to equip the aquarium planned for the Museum, and it would be possible, with our facilities, to provide during the summer months for the instruction in marine zoölogy of a large number of students at a comparatively small expense, and thus to limit the use of the smaller Laboratory at Newport to the more advanced students.

The addition of a large public Aquarium to the equipment of the Newport Laboratory would be an important adjunct. A most interesting and instructive public exhibit could easily be made from the more common marine animals of this part of our coast, and it is quite possible to obtain the support of a sufficient number of the residents of Newport in the establishment of an Aquarium, as considerable interest has always been manifested in such a project. The Aquarium once built and in running order, there is little doubt that its ordinary expenses could be met by annual subscriptions and by the small admission fees charged to the transient public.

It would of course be of immense advantage if the Laboratory could control a large steamer of about two hundred feet in length, to be used for research and as a peripatetic laboratory for exploration along all parts of our coast or elsewhere. Such facilities, however, demand a large original outlay and a large annual expenditure. From $75,000 to $100,000 would be needed for the equipment of the vessel, and an annual income of from $25,000 to $30,000 to run it to advantage, and to provide the means of publication for the Station. Such an equipment would, however, be unique among the stations now in existence, and nothing would tend to develop more rapidly our knowledge of the natural history of the sea than such a vessel, well equipped and in charge of a director competent to undertake even distant expeditions devoted to the solution of some special problem of thalassography.

ALEXANDER AGASSIZ.

CAMBRIDGE, October 1, 1892.

REPORTS ON THE GEOLOGICAL DEPARTMENT.

I. REPORT ON THE COURSES OF INSTRUCTION.

By Professors J. D. Whitney, N. S. Shaler, W. M. Davis, and Assistant Professor J. E. Wolff.

During the Academic year 1891–92, the following named courses of instruction were given in the laboratories and in the field by the instructors in the department.

Instruction in Geology.

1. Geol. 4. A half-course in Elementary Geology; two lectures a week by N. S. Shaler, with one hour for special exercises conducted by R. E. Dodge, Assistant in Geology, with required reading in Dana's Manual of Geology. In the spring, voluntary excursions were made to points of geological interest in the vicinity of Cambridge under the guidance of the assistant. The course was attended by two hundred and forty-six students.

2. Geol. 5. A half-course of Practical Geological Exercises in the Laboratory and in the field, with occasional lectures by T. W. Harris, assisted by H. B. Kummel; designed especially for those who intend in subsequent years to continue the study of Geology and Palæontology. Half-course, with two-hour exercises, twice a week. Attended by eighty-seven students.

3. Geol. 8. A course of Advanced Geology, two lectures a week, and for a part of the year three, by N. S. Shaler, with an additional hour for review of assigned reading conducted by J. B. Woodworth. Students in this course were required during the second term to prepare theses on subjects chosen with the advice of their instructors. During the first and third terms, eight half-day excursions were made into the field in the vicinity of Cambridge, under the guidance of J. E. Wolff and J. B. Woodworth. Those only who passed a satisfactory examination in the elementary courses were permitted to attend. Fifty-six students received this instruction.

4. Geol. 9. A course in the Structural and Dynamical Geology of the stratified rocks, by T. W. Harris. Two lectures a week, with required reading and theses. This course was attended by seven students.

5. Geol. 18. A course in Economical Geology, by J. D. Whitney, assisted by L. G. Westgate. Lectures twice a week, with required reading and theses. Attended by twenty-eight students.

6. Geol. 22. A course in field-work and geological surveying, designed to afford special training, with work in the library and the preparation of geological reports, under the direction of N. S. Shaler, W. M. Davis, J. E. Wolff, and T. W. Harris. Conferences were held once a week during the year. This course is open only to those who have attained satisfactory grades in Courses 8, S. 2, and in either Chemistry C or 2. It was attended by seventeen students.

Instruction in Palæontology.

7. Geol. 14. A course in Palæontology, by N. S. Shaler, assisted in the Laboratory by R. T. Jackson. Two lectures a week, with four hours' laboratory work and theses. This course was attended by eleven students.

8. Geol. 15. A course in Historical Geology, designed to train advanced students in the use of fossils in determining geological horizons, by N. S. Shaler, assisted by R. T. Jackson. This course was taken by one student.

9. Geol. 24. A course in Palæontological Research, under the direction of N. S. Shaler, assisted by R. T. Jackson. Attended by one student.

Instruction in Meteorology and Physical Geography.

10. Geol. 1. A half-course in Elementary Meteorology, by W. M. Davis, assisted by R. DeC. Ward. Two lectures a week, with two hours of laboratory work and recitation, first half-year. Attended by eighty-four students.

11. Geol. 2. A half-course in Physical Geography, by W. M. Davis, assisted by R. DeC. Ward. Two lectures a week, with two hours of recitation and laboratory work, once a week, second half-year. Attended by one hundred and seven students.

12. Geol. 20. A course in Advanced Meteorology and Physical Geography, by W. M. Davis. Conferences held once a week. Attended by eight students.

Instruction in Petrography.

13. Geol. 12. A course in Petrography, by J. E. Wolff. Two lectures a week, with laboratory work, theses, and field work. Attended by thirteen students.

14. Geol. 23. A course in Petrographic Research, by J. E. Wolff. Field and laboratory work. Attended by four students.

Instruction in Summer Schools.

15. Geol. S. 1. An elementary course, beginning July 6th and lasting five weeks, was held in Cambridge, in the Geological Laboratory, by T. W. Harris and H. B. Kummel. This course is parallel to Geology 5, as given in the University. Meetings were held five days each week, with field-work in the vicinity of Cambridge. One excursion was made to the Cambrian and Carboniferous deposits in the town of Attleborough, Mass. This course was attended by sixteen students.

16. Geol. S. 2. An advanced course in field-work on the geology of the stratified rocks was given at the following places during the summer of 1892. The class met at Utica, N. Y., July 7, under the charge of T. W. Harris. On July 20, the class moved to Catskill, N. Y., and on the 4th of August went to Meriden, Conn., where the work of the class was in charge of H. B. Kummel. This course closed on August 19. Twelve students attended the course.

17. Geol. S. 3. A half-course in independent field investigation and geological surveying, under the supervision of N. S. Shaler, W. M. Davis, J. E. Wolff, and T. W. Harris. Two parties of students began work in this course in Eastern Massachusetts in the summer of 1892, one with Dr. Harris on the Structure of the Boston Basin, and a second with J. B. Woodworth on the Carboniferous and Cambrian Rocks of Norfolk and Bristol Counties. The work in this course lasts for six weeks, and will be completed before October 1st. Six students have taken this instruction.

Additional Instruction.

During the year, the students in the advanced courses attended regular Tuesday evening meetings in the Geological Laboratory, which were designed to serve the purpose accomplished by the Seminaria of the German Universities. A number of the papers read at these conferences have been announced in the College Calendar. In addition to the papers presented by students, a paper was read by Baron de Geer, of Sweden, "On the Changes of Level on the Atlantic Coast."

II. REPORT OF THE STURGIS-HOOPER PROFESSOR OF GEOLOGY.

By Josiah D. Whitney.

During the past year a course of sixty lectures on Economical Geology was delivered to about twenty-five students, mostly Graduates and Seniors. As the instruction in this subject is now arranged, the subject of Economical Geology occupies two years, the first half of the course being, as a general rule, taken by Seniors or Juniors, and the second half by Graduate students. In the former, the subject of the mode of occurrence of the metalliferous ores is very briefly treated; in the latter, the metals, mining, and metallurgy form the chief topics to which the attention of the student is directed. Both courses together are intended to furnish a desirable amount of information in regard to the economical and practical side of Geology, either to the general student or to those intending to become teachers of the science, and are also preparatory for special studies in this department, to be taken later by those who find themselves able and inclined to go further in this direction.

The arrangement and cataloguing of the Sturgis-Hooper Library has been continued by Miss Clark. The remarks in regard to this matter which were made last year are still applicable.

The climatic investigations spoken of last year as being under way are still in hand, and the material which has been collected is now being arranged for publication.

III. REPORT ON COURSES IN GENERAL GEOLOGY.

By N. S. Shaler.

The course in Elementary Geology (Geol. 4) has been materially strengthened by adding to the usual lectures, about sixty in number, special meetings which are designed to afford further opportunities for acquiring a clear idea of the more difficult parts of the subject matter. These meetings have been held in small sections of from fifteen to twenty students, under the charge of Mr. R. E. Dodge, Assistant in the Department. They are in effect recitations, and they have clearly served to secure ends which experience shows are unattainable by a lecture system alone, however fully that method may be supplemented by frequent examinations.

In the course of Advanced Geology (Geol. 8), Mr. J. B. Woodworth has done a task similar to that effected by Mr. Dodge in the elementary course; but in addition to holding special meetings in small sections for recitation and review, he has supervised the preparation of theses which the members of the class are required to write, and he has also aided Professor Wolff in the field instruction.

Early in the year, Dr. R. T. Jackson was employed to take charge of the laboratory work in the first course in Palæontology (Geol. 14), and of the considerable collection which has gradually been provided for the use of that class. By his aid, the detailed instruction which is intended to supplement the lectures and book-work has been at length brought to a satisfactory state. The collection has been increased by the purchase of specimens needed to extend the series of fossils which are of the most importance for the use of students, and which could not be spared from the general collections of the Museum. Dr. Jackson has also rendered assistance to the student in Historical Geology (Geol. 15) and Palæontological Research (Geol. 24).

The large magic lanterns placed in the Geological Lecture-room have been used throughout the year in the elementary courses (Geol. 4 and 5) with profit and success. Five cases, accommodating ninety-six trays, have been placed in Room 2, for the use of the Palæontological Assistant, and several volumes needed for laboratory work have been added to the library in the same room.

A number of specimens illustrating geological phenomena have been added to the teaching collection in the Geological Laboratory. Among the most important is a second block from Kelly's Island in Lake Erie, showing glacial fluting and striation, given by Benjamin Cook, Esq. A portion of a mastodon's jaw, with several teeth attached, from the Pleistocene deposits of Iowa, was presented by Mr. John A. Mott.

The collection of photographs and lantern views has been much augmented during the year. The work of cataloguing and arranging the collection has been nearly completed by Mr. J. L. Gardner, Jr., who, as volunteer assistant, has rendered valuable aid to the department. This collection has proved to be of very great value in our instruction. The phenomena of mountain structure and the relation of structure to topographic form, of glaciers and their effects, and of volcanic action, can now be effectively presented to the classes by the aid of these illustrations. The classification of the photographs and lantern slides, already undertaken, will provide an arrangement, first, according to localities, and, secondly, by means of cross references to particular classes of subjects, which can thus be easily brought together for temporary use.

IV. REPORT ON THE LABORATORY OF PHYSICAL GEOGRAPHY.

By W. M. Davis.

Instruction in elementary Physical Geography and Meteorology has been maintained during the past year, under the direction of Professor W. M. Davis, and with the assistance of Mr. R. DeC. Ward, on the plan described in the Report for 1890–91. The illustration of the lectures on Physical Geography by means of lantern slides has been the chief innovation, a large series of slides having been purchased or especially prepared for this course. Various forms of clouds were illustrated in the same way in the course on Meteorology. The elementary courses were repeated in parallel lectures during the year to classes in the Society for the Collegiate Instruction of Women. Three public lectures for teachers on Teaching Geography were given in the spring.

The advanced course in Physical Geography and Meteorology was attended by seven students, the following subjects being discussed in weekly conferences: thunder-storms in New England in 1886–87 (based on reports by volunteer observers of the New England Meteorological Society), the "eye" of the storm, the cyclonic storms of India, the diurnal variation of temperature at Denver, Col. (based on thermographic records lent by the Harvard College Observatory), the evolution of the Mississippi River, the physical geography of Wisconsin, the physical geography of Arkansas, and the rivers of Connecticut; the last three subjects being treated by students who were familiar with the States mentioned, either from residence, or from geological field-work within them.

Advanced work in Field Geology has been done by two graduate students, under the direction of Professor Davis, in connection with his study of the Triassic Area of Connecticut for the United States Geological Survey; besides which there has been special work in the Laboratory by Mr. L. S. Griswold in compiling a map of the Triassic Area from the reports of various assistants; and by Mr. S. Ward Loper in arranging and classifying an extended collection of Triassic fossils, which has since been sent to the National Museum in Washington.

The office of the New England Meteorological Society has been maintained in the Laboratory of Physical Geography for several years past. The monthly Bulletin of the Society, containing reports from about one hundred and fifty observers, has been issued regularly from this office, with the assistance of Mr. J. Warren Smith of the United States Weather Bureau, who was especially assigned to this work by the Chief of the Bureau, and with the support of the Director of the Harvard College Observatory, the Bulletin being published in the Annals of that institution. In March, 1892, it seemed advisable to transfer the work of collecting and publishing monthly meteorological reports to the New England Weather Service, established at that time for this purpose, the service being under the direction of Mr. Smith, and having its office in the rooms of the Weather Bureau, in Boston. Professor Davis has thus been relieved of the responsibility of superintending the preparation of the Society's Bulletins. At about the same time, the publication of the American Meteorological Journal was removed from Ann Arbor, Mich., to Boston; Professor M. W. Harrington, who had founded the Journal and edited it from the beginning, having removed to Washington on his appointment as Chief of the Weather Bureau, and his place as editor being assumed here by Mr. R. DeC. Ward, Assistant in Physical Geography. Mr. Ward has also undertaken a study of thunder-storms in New England for the Weather Bureau, on a plan similar to that followed by Professor Davis for the New England Meteorological Society from 1885 to 1887. The results of Mr. Ward's work in this direction will be published by the Weather Bureau.

The collections of the Laboratory of Physical Geography have been increased chiefly in the direction of photographs and lantern slides. The most important additions are as follows: —

A series of cloud photographs, presented by Professor Denza, Director of the Specula Vaticana, Rome.

A series of cloud photographs in the Alps, presented by Jas. Ecclés, Esq., of London.

A series of large landscape views on the line of the Baltimore and Ohio Railroad, presented by the company.

A series of views of Pilot Mountain, N. C., presented by the Cape Fear and Yadkin Valley Railroad Company.

A series of photographs and slides, purchased from the Alaskan expedition of 1891, led by Mr. I. C. Russell.

A series of Spitzbergen photographs, bought through Professor H. Sjögren, of Upsala, Sweden.

A series of photographs and slides of the Mascaret of the Seine at Caudebec, bought from A. Witz, Rouen, France.

An extended series of photographs and slides, purchased from Messrs. W. H. Jackson and Company, of Denver, Col., representing views in the Western Territories, Louisiana, Florida, and Mexico.

A large number of photographs and slides from Mr. S. R. Stoddard, of Glen's Falls, N. Y., representing landscapes in New York and New England.

A series of lantern slides made from photographs in the Laboratory collection, by Mr. P. P. Sharples, Class of '95.

Especial attention has been given during the past year to the extension of the University collections of modern topographic maps, on which the more advanced study of Physical Geography so largely depends. An appropriation for this purpose was granted to this department by the University Library Council, and topographic maps of Saxony, Austria, and the Netherlands have thus been purchased. It is hoped that this appropriation may be continued for some years, until the collection of modern maps is substantially completed. A large series of maps has been received from the United States Coast and Geodetic Survey, and from the United States Geological Survey.

V. REPORT ON THE PETROGRAPHICAL LABORATORY.

By J. Eliot Wolff.

TWO courses were given in Petrography, an elementary course in General Petrography, and an advanced course in Petrographical Research. The first course was attended by fourteen students, and the second by five, — in all, the largest number since the establishment of the Laboratory.

The equipment was materially enlarged by the purchase of a large Voigt and Hochgesang petrographical microscope and two medium-sized microscopes, and in other ways. The collections were increased by the purchase of 150 rock specimens from Krantz in Bonn, and otherwise, and by the addition of 350 thin sections of rocks. The laboratory is also enabled to use, by the kindness of Mr. Agassiz, the large microphotographic and projecting apparatus of Zeiss, recently purchased.

It is a pleasure to record the gift to the University for the use of the Geological Department, by Dr. Lucius G. Hubbard, of the large and valuable collection of rocks from the Laacher See region in Germany, which formed the basis of his monograph in Tschermak's *Mineralogische und Petrographische Mittheilungen*, 1887, "Beiträge zur Kentniss der Noseanführenden Auswürflinge des Laacher Sees."

Petrographical investigation was begun on the felsites of the Boston region by several students in common, which it is hoped will continue this year.

A monograph was completed by Mr. G. L. Collie on Conanicut Island, R. I., and investigations were carried on by Mr. J. B. Woodworth on rocks of the Narragansett Basin, and by Mr. L. G. Westgate on rocks from Jenny Jump Mountain, N. J. A paper, by the instructor jointly with R. S. Tarr, "On Akmite Trachytes from the Crazy Mountains," is ready for publication.

The instructor was engaged during the year with several assistants in the study of the structure of the Archæan Highlands of New Jersey, and the study of the eruptive rocks of the Crazy Mountains was continued.

PUBLICATIONS BY MEMBERS OF THE GEOLOGICAL DEPARTMENT.

THE following papers of a scientific nature have been published during the year.

By N. S. Shaler: —

1. General Account of the Fresh Water Morasses of the United States, with a Description of the Dismal Swamp of Virginia and North Carolina. Tenth Annual Report of the Director of the United States Geological Survey, Washington, D. C., 1890, pp. 255–339, Plates VI.–XIX. 38 figs.
2. The Antiquity of the Last Glacial Period. Proc. Bost. Soc. Nat. Hist., March 4, 1891, Vol. XXV. pp. 258–267.
3. The Story of Our Continent: a Reader in the Geography and Geology of North America, for the Use of Schools. Boston, U. S. A., published by Ginn and Company, 1892, pp. 290. (Illustrated.)
4. Report on the Work done in the Atlantic Coast Division of the United States Geological Survey for the Year ending June 30, 1889. Tenth Annual Report of the Director of the U. S. Geological Survey. Washington, D. C., pp. 117–119, 1890.

By W. M. Davis: —

Ferrel's Contributions to Meteorology. Amer. Meteorological Journ., 1891, VIII. 348–359.

The Catskill Delta in the post-glacial Hudson Estuary. Proc. Bost. Soc. Nat. Hist., 18 Nov., 1891, Vol. XXV. pp. 318–334. Illustrated.

The Lost Volcanoes of Connecticut. Pop. Sci. Mo., Dec., 1891, XL. 221–235. Illustrated.

The Theories of Artificial and Natural Rain. Amer. Meteorol. Journ., March, 1892, VIII. 493–502.

Mirage on a Wall. Ibid., pp. 525, 526.

Meteorology in the Schools. Ibid., 1892, IX. 1–21.

The Teaching of Geography. I. The Physical Basis of Descriptive Geography. Educational Rev., May, 1892, Vol. III. pp. 417–426. — II. What to avoid in Teaching Geography. Ibid., June, 1892, Vol. IV. pp. 6–15.

Note on Winter Thunderstorms. Amer. Meteorol. Journ., Aug., 1892, IX. 164–170.

Biographical Notices of Professor William Ferrel. Science, Nov. 13, 1891; Nation, Oct. 29, 1891; and Pop. Sci. Mo.

Outline of Elementary Meteorology. A Synopsis of Course "Geology 1" at Harvard College, 1892–93. Cambridge, Wheeler, 1892, 12mo, pp. 13.

Outline of a Course in Elementary Descriptive and Physical Geography, for Grades IV. and V. in the Cambridge Grammar Schools, 1892–93, 8vo, pp. 45.

Four Elementary Essays on the Shore Lines of Lake Bonneville, the Cañon of the Colorado, the Folds of the Appalachians, the Mountains of Pennsylvania, in Goldthwaite's Geographical Magazine, January, March, April, and May, 1892.

By J. E. Wolff: —

The Geology of the Crazy Mountains, Montana. Bull. Geol. Soc. America, 1892, Vol. III. pp. 445–452.

By T. W. Harris: —

Mount Bob, Mount Ida, or Snake Hill. American Journal of Science, March, 1892, Vol. XLIII. pp. 236–238.

By R. DeC. Ward: —

Another River Pirate. Science, 1892, XIX. 7–9.

Artificial Rain; a Review of the Subject to the Close of 1889. Amer. Meteorol. Journal, 1892, VIII. 484–493.

Thunderstorms in New England during the Year 1886. Ibid., 1892, IX. 21–28.

Thunderstorms in New England during the Year 1887. Ibid., 1892, IX. 211–215.

The first Scientific Balloon Voyage. Ibid., 1892, IX. 58–63.

By J. B. Woodworth: —

Note on the Occurrence of erratic Cambrian Fossils in the Neocene Gravels of the Island of Martha's Vineyard. American Geologist, April, 1892, Vol. IX. pp. 243–247. (3 figs.)

The following theses by students in the advanced course in Physical Geography have been published during the year past: —

The Drainage of the Bernese Jura, by Aug. F. Foerste, Graduate Student. Proc. Bost. Soc. Nat. Hist., 1892, XXV. 392–418. With two Plates, and a Supplementary Note on the Drainage of the Pennsylvania Appalachians, by W. M. Davis. Ibid., 418–420. (Note. The thesis by Mr. Foerste was prepared in the academic year 1889–90, but its publication was delayed until after its author had studied his subject on the ground in Switzerland in the following year.)

The Eye of the Storm, by S. M. Ballou, Class of '93, Harvard College. Amer. Meteorol. Journal, 1892, IX. 67–84, 121–127.

Objections to Faye's Theory of Storms, by W. C. Moore, Special Student, Lawrence Scientific School. Ibid., 170–177, 197–206.

REPORT ON THE INSTRUCTION IN ZOÖLOGY.

By E. L. Mark.

The courses of instruction in Zoölogy have been the same in their general scope during the past year as in the year 1890–91, but the courses formerly conducted by Dr. G. H. Parker have been carried on by Dr. C. B. Davenport.

As will be seen from the accompanying table, there were one hundred and ten students in Zoölogy 1. The First Assistant in the course was Mr. H. M. Kelly, the Second Assistant Mr. J. C. Hubbard.

Dr. Davenport had the assistance of Mr. W. S. Nickerson in the laboratory work of Zoölogy 2, in which there were forty-five students.

Zoölogy 3 was conducted by Dr. Davenport alone, there being nineteen students in the course.

There were seven students, principally Graduates and Seniors, in each of the Courses 4 and 5. Dr. Woodworth, who has been appointed Instructor in Microscopical Anatomy, in addition to assisting in the laboratory work of both these courses, delivered a part of the lectures in Zoölogy 4.

Dr. Slade proposes in the future to make his course in Osteology (Zoölogy 10) a research course for advanced students, and it will hereafter be designated as Zoölogy 20*c*.

Of the nine students pursuing special work (Zoölogy 20*a*), two received at the last Commencement the degree of Doctor of Philosophy.

The number of students from the separate classes in each of the zoölogical courses is given in the following table: —

Class.	Gr.	Sen.	Jun.	Sop.	Fr.	Spec.	Sci.	Total.
Zoöl. 1	4	13	13	23	23	14	20	110
" 2	4	11	10	9	2	4	5	45
" 3	4	5	6	1		2	1	19
" 4	3	3				1		7
" 5	3	3				1		7
" 10	1	1	2				1	5
" 20*a*	6	1					2	9

The meetings of the Zoölogical Club have been well attended, and of the usual interest.

Besides supervising the Contributions from the Zoölogical Laboratory, I have finished the translation of O. Hertwig's *Lehrbuch der Entwicklungsgeschichte des Menschen*, etc., which will be issued simultaneously by Swan Sonnenschein & Co. in London, and Macmillan & Co. in New York. I have also made a short contribution to the "Festschrift für Leuckart," to be published in October, entitled *Polychœrus caudatus*, *nov. gen. et nov. sp.*

Since my last report the following Contributions from the Zoölogical Laboratory have been published in the Museum Bulletin: —

XXVIII. Observations on Budding in Paludicella and some other Bryozoa. By C. B. Davenport. (12 Plates.) December, 1891, Bull. Mus. Comp. Zoöl., Vol. XXII. No. 1, pp. 1–114.

XXIX. The Gastrulation of Aurelia flavidula, Pér. & Les. By Frank Smith. (2 Plates.) December, 1891, Bull. Mus. Comp. Zoöl., Vol. XXII. No. 2, pp. 115–126.

XXX. Amitosis in the Embryonal Envelopes of the Scorpion. By H. P. Johnson. (3 Plates.) January, 1892, Bull. Mus. Comp. Zoöl., Vol. XXII. No. 3, pp. 127–162.

XXXI. The Mesoderm in Teleosts; especially its Share in the Formation of the Pectoral Fin. By E. R. Boyer. (8 Plates.) April, 1892. Bull. Mus. Comp. Zoöl., Vol. XXIII. No. 2, pp. 91–134.

XXXII. On Nectonema Agile, Verrill. By Henry B. Ward. (8 Plates.) June, 1892. Bull. Mus. Comp. Zoöl., Vol. XXIII. No. 3, pp. 135–188.

The following papers are under way: —

By C. B. Davenport: —

On Urnatella gracilis, Leidy. 6 Plates.

Notes on the Carotids and the Ductus Botalli of the Alligator. 1 Plate.

By W. E. Ritter: —

On the Eyes, the Integumentary Sense-papillæ, and the Integument of the San Diego Blind-fish (Typhlogobius Californiensis, Steindachner). 4 Plates.

REPORT ON OSTEOLOGY.

By D. D. Slade.

This department has received no important additions since the last annual report.

The collections remain in excellent condition, and have received neither damage nor loss.

Several specimens have been received for identification, and two small collections from different sources, which were offered during the vacation, have not yet been determined.

Instruction by means of lectures, examinations, and laboratory work has been given during the academical year to five students, three of whom were undergraduates, one was a Graduate, and one a Lawrence Scientific Student. The work performed by them has been generally satisfactory.

The Assistant hopes to make the course of instruction during the coming year one in 'which research will receive more attention than heretofore.

The following papers have been published by me during the past year: —

Osteological Notes. The Jugal Arch in the Order Insectivora. Science, Vol. XIX. p. 203.

Osteological Notes. The Jugal Arch in the Order Rodentia. Science, Vol. XX. p. 46.

Some of the orders in the collection of disarticulated skeletons are still sadly deficient in specimens, — a want which can only be supplied through the generosity of some patron who understands the importance of this department to the scientific student.

REPORT ON THE MAMMALS AND BIRDS.

By William Brewster.

The collection of mounted Mammals has received the following additions: —

A Solenodon (*Solenodon cubanus*) from Cuba; two Armadillos (*Dasypus sexcinctus* and *Tatusia novemcincta*) from Brazil; an arboreal, prehensile-tailed Porcupine (*Synetheres prehensilis*) from Costa Rica; a Hare (*Lepus nigricollis*) from India; a small Deer (*Dorcatherium aquaticum*) from West Africa; a Tree Hyrax (*Dendrohyrax arboreus*) and a small Rodent (*Georynchus capensis*) from Cape Colony; and a Genet (*Genetta vulgaris*) from Algeria (?). The last named is the gift of Dr. H. J. Bigelow. All the others were bought of Ward.

The collection of Mounted Birds in the North American Room has long been an object of adverse comment on the part of visitors critical in such matters, and a source of mortification to the Assistant in this department. Made up chiefly of birds prepared by a taxidermist, whose handiwork, although neat and smoothly finished, is aggressively stiff and conventional, and containing a number of moth-eaten, faded, and dust-stained specimens, contributed years ago by the Harvard Natural History Society, this collection, while perhaps not inferior in quality to the average exhibits of American museums, has suffered by comparison with the superior material in the other and more recently equipped faunal rooms.

It has been Mr. Agassiz's intention to remedy this defect, as soon as opportunity offered and the funds of the Museum permitted, by discarding all but a few of the very best or rarest of the Birds in the North American Room, and replacing them by really well mounted specimens. Such an opportunity has at length occurred, and without the anticipated expense; for Mrs. Greene Smith, of Peterborough, N. Y., has just given to the Museum, under certain very reasonable conditions, about twelve hundred North American birds, together with nearly three hundred Humming-birds from North, Central, and South America. These specimens constitute the greater part of a collection widely known among ornithologists as the "Greene Smith Collection," and of which a catalogue has been printed and distributed.

In many respects the collection of mounted North American birds is the most complete and valuable that has ever been brought together, at least by private effort. It was begun in 1867, and the work continued up to the time of Mr. Smith's death, in 1880, after which only a few specimens were added. At first, Mr. Smith hoped to collect all the birds himself, and very many were taken by him personally, chiefly in Madison County, New York, Cook County, Illinois, and Hernando County, Florida; but failing health finally compelled him to abandon this plan, and to buy a considerable number of skins, most of which, together with all the Humming-birds, were obtained from John G. Bell, of New York City. The entire collection, with the exception of a few birds, was mounted by Mr. Bell, who at one time stood foremost amongst American taxidermists, and whose best work is perhaps not excelled by any of the present day.

The conditions above referred to are, in brief, that the North American birds shall be kept together and known as the "Greene Smith Collection," and that each specimen originally belonging to it shall be so labelled. Imperfect or otherwise unsatisfactory specimens may be discarded, but all such must be returned to Mrs. Smith or her heirs. The collection may be added to, however, at the discretion of the officers of the Museum.

These conditions have been accepted, and the collection has been safely transported to Cambridge. It will be arranged and placed on exhibition as soon as some changes necessary for its reception have been made in the cases of the North American Room. Some of the best of the old birds will be retained and added to the new collection, but most of them will be unmounted and distributed among the collection of skins. The Humming-birds are to be placed in a case by themselves, probably in one of the Systematic Rooms.

An important addition has been made to the exhibit in the Pacific Room by the purchase, from Mr. Scott B. Wilson, of the following birds from the Sandwich Islands: *Charadrius fulvus*,

Bernicla sandvicensis, *Psittacirostra psittacea*, *Acrylocercus nobilis*, *Acrylocercus braccatus*, *Chrysomitridops cæruleirostris*, *Vestiaria coccinea*, *Loxioides bailleni*, *Hemignathus olivaceus*, *Hemignathus procerus*, *Phæornis obscura*, *Himatione virens*, *Himatione sanguinea*, *Oreomyza bairdi*, *Chasiempis ridgwayi*, *Chasiempis dolei*. Two Rails, probably *Corethrura obscura* (Gmel.), sent to Mr. Agassiz by Mr. William T. Brigham, at the request of Hon. S. B. Dole, by whom they were obtained from Layson Island, will also be mounted for this collection, which now represents most of the species resident in and peculiar to the Sandwich Islands.

The only further acquisitions in this department are two specimens, male and female, of the "Oropendula" (*Gymnostinops montezuma*), with several of its curious nests, from Copan, Honduras, presented by the Peabody Museum Honduras Expedition, and a Brazilian Parrot (of the genus *Chrysotis*), received from Mrs. Josiah W. Cook, of West Somerville, Mass.

REPORT ON THE REPTILES AND FISHES.

By Samuel Garman.

The following are included in the list of those who have contributed to the collections in these departments by donation: Mr. Bradlee Whidden, Mr. N. Vickary, Dr. J. G. Owens (through Prof. F. W. Putnam), Dr. T. G. Lee, Dr. L. C. Jones, Dr. W. M. Haines, Mrs. Capt. Josiah W. Cooke, Miss I. Batchelder, and Prof. Alex. Agassiz.

Parcels were taken out for the United States National Museum, Prof. F. H. Snow, Prof. C. J. Maynard, Dr. G. A. Boulenger, Dr. T. G. Lee, Prof. J. W. P. Jenks, and the University students.

Valuable exchanges have been received from Dr. Georg Baur, Prof. J. W. P. Jenks, Dr. Julius Hurter, the United States National Museum, and the Imperial Museum at St. Petersburg. From the last we received important types from Central Asia. Dr. Hurter, from the Southwestern States, sent us living specimens, which before killing provided occasions for new and confirmatory observations on disputed points, and which afterwards were put into excellent condition for the exhibition cases. The lot from Professor Jenks contained representatives from the Gulf coast of the Southwest. Dr. Baur's collections were from the Galapagos Archipelago and the adjacent South American coast. These last, with that of Professor Jenks, were determined and subjected to special study and publication. In connection with the routine work, the exhibit for Madagascar has been selected and put in place, and various changes and additions have been made in other representations. To the number of large mounted specimens have been added a large Alligator, various Sharks, several Fishes, and some Land Tortoises. The Deep-sea Fishes taken in the work of the United States Fishery Commission steamer "Albatross" in the tropical Pacific are now in hand, under investigation.

Besides reviews and book notices on kindred subjects, not signed, the subjoined publications have been sent out during the year.

In the Memoirs of the Museum of Comparative Zoölogy, Vol. XIV. No. 2: —

"The Discoboli (Cyclopteridæ, Liparopsidæ, and Liparididæ)."

In the Bulletin of the Essex Institute: —

"The Reptiles of the Galapagos Islands."
"On Texan Reptiles."
"On Reptiles collected by Dr. Geo. Baur near Guayaquil, Ecuador."
"On Cophias and Bachia."

In the Proceedings of the Boston Natural History Society: —

"Dr. D. H. Storer's Work on the Fishes."

In the Annual Report of the Commissioners on Inland Fisheries of Massachusetts: —

"Report on the Lobster."

In "Science": —

"The Vesicles of Savi."
"The Distribution of Fishes."
"Dr. Storer's Work on the Fishes." (Also in Proc. B. N. H. Soc.)
"Sistrurus and Crotalophorus."
"The Reptilian Rattle."

REPORT ON THE PALÆONTOLOGICAL DEPARTMENT.

By Alpheus Hyatt.

The Trigoniidæ, Ostreidæ, Pinnidæ, and some other families of Lamellibranchs, have been worked over with greater or less care, and materials selected for exhibition.

A large amount of miscellaneous work, which cannot be reported upon specifically, has been done in order to prepare the way for the selection of materials to be placed upon exhibition. The Schary, Day, Dyer, Walcott, and other collections of Silurian and Devonian Brachiopoda have been similarily treated, the genera brought together, and the materials picked out for exhibition.

The enormous number of specimens in these collections, and the fact that the same species frequently appears under different names, and the same genus in one collection may be split up into half a dozen genera in another, makes such work more tedious and difficult than had been anticipated. Before the specimens selected for exhibition are finally labelled, it will be necessary to revise the generic names to avoid confusion.

As in previous years, the department has had the benefit of the labors of Dr. R. T. Jackson. He has distributed the Triassic and Permian collections reported upon last year as still intact, and therefore all the Fossil Invertebrata are, with the exception of one tier of cases reserved for slabs and miscellaneous materials in Room A, arranged zoölogically as described in the last Annual Report. He has also done considerable work in various departments which cannot be reported upon in detail, and has distributed into their proper genera a large number of Tertiary Lamellibranchs.

Miss Clarke has been employed as usual in dusting, securing specimens on tablets where necessary, writing labels, etc.

We have received from Messrs. Wachsmuth and Springer twenty-eight choice specimens of Crinoids from Indian Creek, Montgomery County, Indiana.

Mr. C. D. Walcott has returned a small collection of Lower Cambrian fossils, borrowed by him some years since for investigation.

The following papers have been published during the year by the Assistants in this department: —

Carboniferous Cephalopods, by Alpheus Hyatt, Geol. Surv. of Texas, Sec. Ann. Rept., 1890, pp. 329–356, with thirty-seven cuts.

Remarks on the Pinnidæ, by Alpheus Hyatt. Proc. Bost. Soc. Nat. History, XXV., 1891, pp. 335–346.

Beecher's Studies of the Brachiopoda (a Review), by R. T. Jackson. Am. Nat., Oct., 1892.

REPORT ON THE LIBRARY.

By Miss F. M. Slack.

During the year ending September 1, 1892, the Library has received 584 volumes, of which 20 are Atlases, 1,915 parts, and 253 pamphlets: —

	VOLUMES.	PARTS.	PAMPHLETS.
Gift	6	57	12
Exchange	208	746	61
Purchase	54	288	1
A. Agassiz	145	856	25
Binding Parts	129		
Whitney Library	47	18	154
	584	1915	253

The number of volumes now in the Library (exclusive of pamphlets and the greater part of the Whitney Library) is 20,391. There are 14,296 pamphlets bound in 2,366 volumes, making the total number of volumes 22,757.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE ACADEMIC YEAR 1891-92.

Of the Bulletin.

Vol. XXII. [Complete.]

- No. 1. Contributions from the Zoölogical Laboratory. — XXVIII. Observations on BUDDING in PALUDICELLA and some other Bryozoa. By C. B. DAVENPORT. pp. 114. 12 Plates. November, 1891.
- No. 2. Contributions from the Zoölogical Laboratory. — XXIX. The GASTRULATION of AURELIA FLAVIDULA, Pér. & Les. By F. SMITH. pp. 12. 2 Plates. December, 1891.
- No. 3. Contributions from the Zoölogical Laboratory. — XXX. AMITOSIS in the EMBRYONAL ENVELOPES of the SCORPION. By H. P. JOHNSON. pp. 36 3 Plates. January, 1892.
- No. 4. A Fourth Supplement to the Fifth Volume of the TERRESTRIAL AIR-BREATHING MOLLUSKS of the United States and Adjacent Territories. By W. G. BINNEY. pp. 42. 4 Plates. January, 1892.

Vol. XXIII.

- No. 1. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, to the West Coast of MEXICO, and in the GULF OF CALIFORNIA, in charge of ALEXANDER AGASSIZ, carried on by the U. S Fish Commission Steamer "ALBATROSS." — II. GENERAL SKETCH of the EXPEDITION of the "ALBATROSS" from February to May, 1891. By A. AGASSIZ. pp. 90. 22 Plates. February, 1892.
- No. 2. Contributions from the Zoölogical Laboratory. — XXXI. The MESODERM in TELEOSTS: especially its Share in the Formation of the PECTORAL FIN. By E. R. BOYER. pp. 44. 8 Plates. April, 1892.
- No. 3. Contributions from the Zoölogical Laboratory. — XXXII. On NECTONEMA AGILE, Verrill. By H. B. WARD. pp. 54. 8 Plates. June, 1892.

Vol. XXIII. to be continued.

Of the Memoirs.

Vol. XIV.

- No. 2. The DISCOBOLI. Cyclopteridæ, Liparopsidæ, and Liparididæ. By S. GARMAN. pp. 96. 13 Plates. April, 1892.

Vol. XIV. to be continued.

Vol. XVII.

No. 2. Reports on an EXPLORATION off the WEST COASTS of MEXICO, CENTRAL and SOUTH AMERICA, and off the GALAPAGOS ISLANDS, in charge of ALEXANDER AGASSIZ, by the U. S. Fish Commission Steamer "ALBATROSS," during 1891. — I. CALAMOCRINUS DIOMEDÆ, a new STALKED CRINOID, with Notes on the Apical System and the Homologies of Echinoderms. By A. Agassiz. pp. 96. 32 Plates. January, 1892.

Vol. XVII. to be continued.

[B]

THE Virginia Barret Gibbs Scholarship Fund is to be established in connection with the Museum of Comparative Zoölogy at Harvard College, on the following conditions: —

To apply the net income thereof in supporting or assisting to support one or more students who may have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy.

Each person so assisted shall be either a graduate or a student in some department of Harvard University, but not necessarily a candidate for a degree. His studies and researches may be conducted at the Natural History Laboratories of the Museum of Comparative Zoölogy at Harvard College, at the Newport Marine Laboratory, or at such European Laboratories or other place on the sea-shore in this country or elsewhere as may be approved by the Faculty of the Museum of Comparative Zoölogy and by the Professors of Zoölogy and of Comparative Anatomy of Harvard University.

Such assistance may be continued to the same student from year to year, so long as he may be recommended by the Faculty of the Museum and the Professors aforesaid; but the appointment must be renewed annually, and only upon satisfactory evidence that the incumbent is fulfilling the purpose of the endowment.

If in the course of any year no students of sufficient ability and promise shall require aid from said fund, or for any reason the whole income of said fund shall not be expended, the surplus is to be added to the principal of the fund.

The President and Fellows are authorized at their discretion to impose such conditions and make such requirements upon the recipient of aid from said fund as will best secure his faithful devotion to the purposes of this foundation.

[C]

Peterborough, N. Y., August 18, 1892.

William Brewster, Esq.: —

Dear Sir, — I wish to place the collection of birds, left by my husband, where it will be safe, well cared for, kept intact, as far as practicable, and made use of by students of ornithology; and where it may remain a monument to the life-work of Greene Smith.

I will give the collection (with a few exceptions to be named hereafter) to the Museum of Comparative Zoölogy at Cambridge, Mass., on the following conditions: —

1st. That the North American Collection shall practically replace the present North American Collection of the Museum, and shall be kept together as far as possible; each specimen to be labelled conspicuously with the name of Greene Smith.

2d. The Museum shall be allowed to make future additions to the collection; but it shall be privileged to discard *only* such specimens as are positively bad.

3d. Any part of the collection which the Museum may at any time discard shall be returned to me or my heirs.

4th. The Museum, at its own expense, is to pack and transfer the collection within the next sixty days.

From the Collection of North American Birds I reserve one specimen, No. 886. I also reserve the foreign specimens, excepting the case of Humming-birds.

Yours very truly,

Elizabeth F. Smith.

[D]

INVESTED FUNDS OF THE MUSEUM.

IN THE HANDS OF THE TREASURER OF HARVARD COLLEGE, SEPT. 1, 1890.

Sturgis-Hooper Fund	$100,000.00
Gray Fund	50,000.00
Agassiz Memorial Fund	297,938.10
Teachers and Pupils Fund	7,594.01
Permanent Fund	117,469.34
Humboldt Fund	7,740.66
Virginia Barret Gibbs Scholarship Fund	5,000.00
	$585,737.11

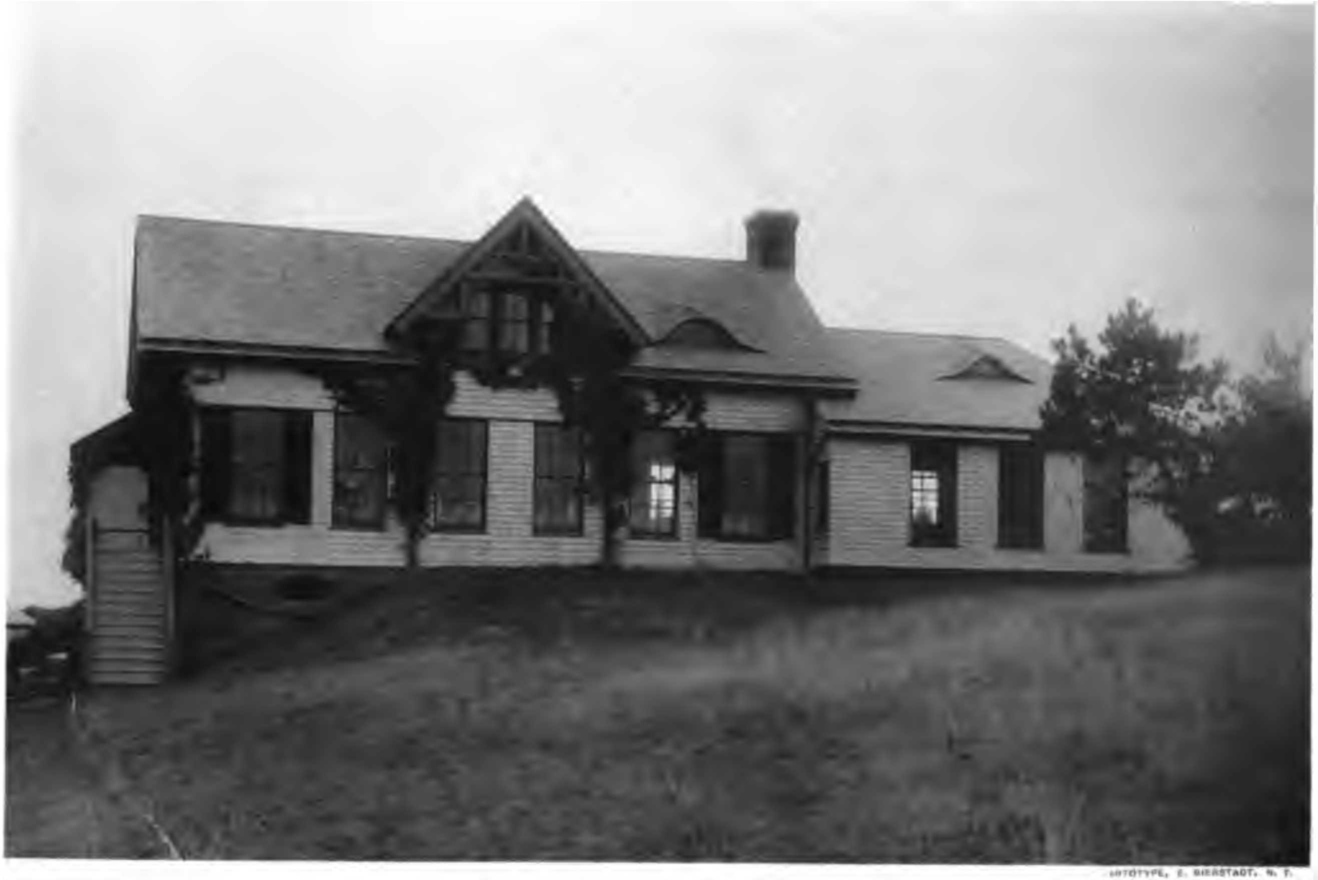
The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Curator. The accounts are annually examined by the Museum Faculty and a committee of the Overseers. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts with vouchers to the payment of which the income is applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Humboldt Fund (about $400) can be applied for the benefit of one or more students of Natural History, either at the Museum, the Newport Marine Laboratory, the United States Fish Commission Station at Wood's Holl, or elsewhere.

Applications for the tables reserved for advanced students at the Newport Marine Laboratory, and for the tables at the Wood's Holl Station, should be made to the Director of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

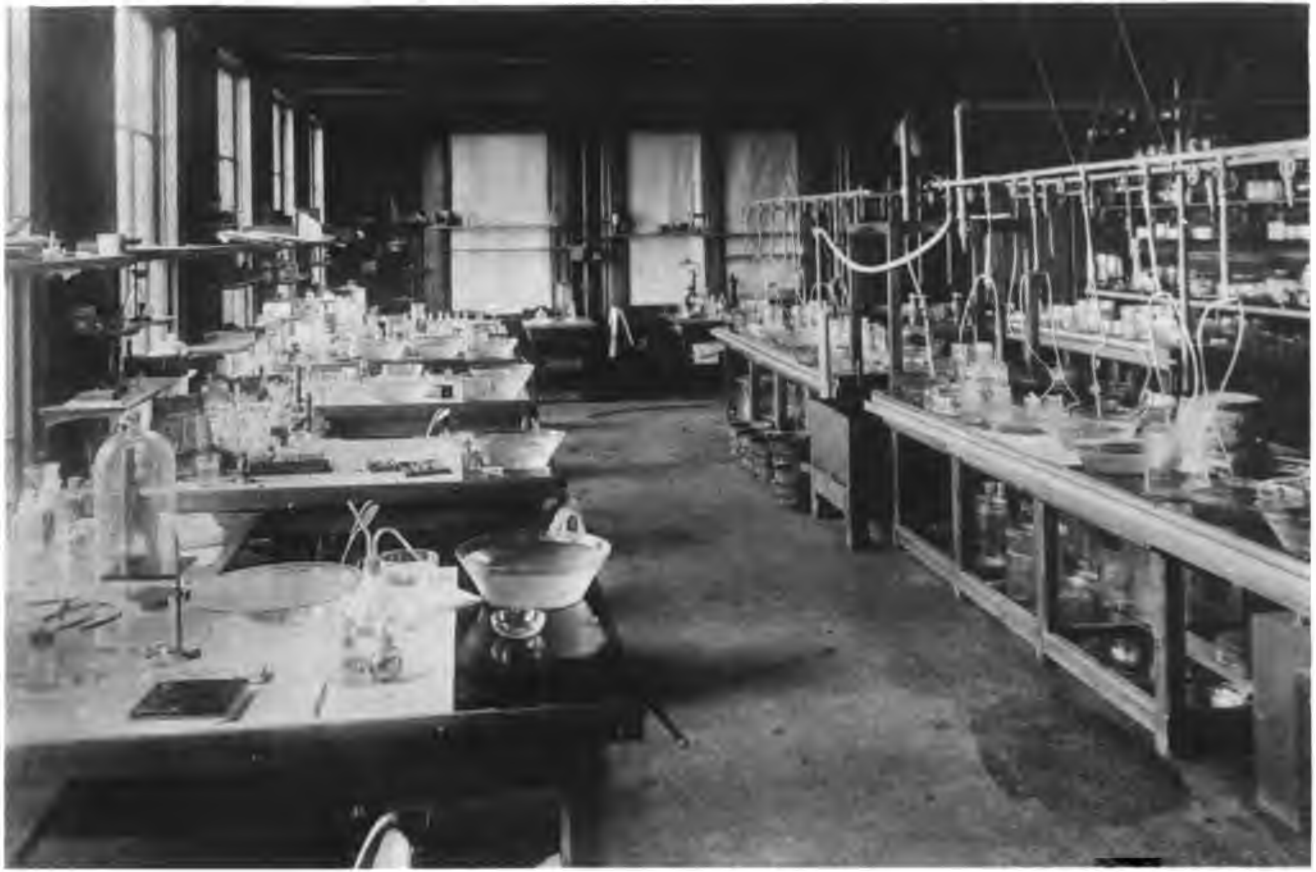
The income of the Virginia Barret Gibbs Scholarship Fund, of the value of $250, is assigned annually, with the approval of the Faculty of the Museum, at the recommendations of the Professors of Zoölogy and of Comparative Anatomy in Harvard University, "in supporting or assisting to support one or more students who have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy."



ARTOTYPE, E. BIERSTADT, N. Y.

NEWPORT MARINE LABORATORY.

NORTH ELEVATION.



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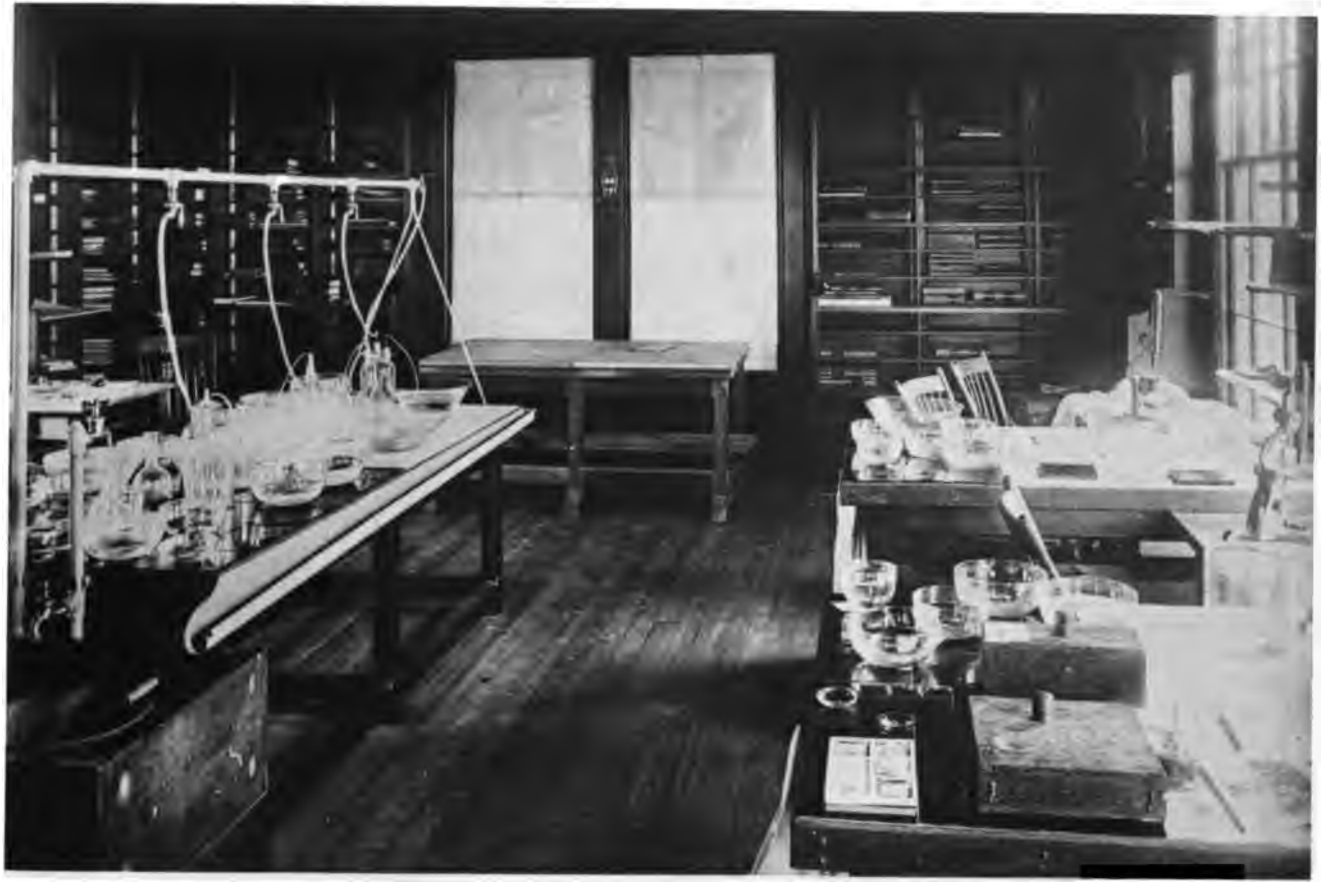
NEWPORT MARINE LABORATORY.

EAST ROOM



ARTOTYPE, E. BIERSTADT, N. Y.

NEWPORT MARINE LABORATORY.

WEST ROOM.

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Mus. 120.20.6.

With the Compliments of

ALEXANDER AGASSIZ.

ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE,

FOR

1892–93.

CAMBRIDGE, U. S. A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1893.

Case Shelf

LIBRARY
OF THE
Peabody Museum of American Archæology and Ethnology
IN CONNECTION WITH HARVARD UNIVERSITY.

PRESENTED BY
A. Agassiz.

Received Jan. 1894.

ANNUAL REPORT

OF

Cambridge

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OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

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PRESIDENT AND FELLOWS OF HARVARD COLLEGE,

FOR

1892–93.

CAMBRIDGE, U. S. A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1893.

MUS. 120.20.6.1

Gift of
A. Agassiz
Rec. January, 1894

FACULTY OF THE MUSEUM.

CHARLES W. ELIOT, *President.*
ALEXANDER AGASSIZ, *Curator.* GEORGE L. GOODALE.
JOSIAH D. WHITNEY, *Secretary.* HENRY P. WALCOTT.

OFFICERS.

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JOSIAH D. WHITNEY	*Sturgis-Hooper Professor of Geology.*
NATHANIEL S. SHALER	*Professor of Geology.*
E. L. MARK	*Hersey Professor of Anatomy.*
WILLIAM MORRIS DAVIS	*Professor of Physical Geography.*
J. ELIOT WOLFF	*Assistant Professor of Petrography.*
THADDEUS W. HARRIS	*Instructor in Geology.*
ROBERT TRACY JACKSON	*Instructor in Palæontology.*
J. B. WOODWORTH	*Instructor in Geology.*
H. L. SMYTHE	*Instructor in Geological Surveying.*
W. McM. WOODWORTH	*Instructor in Microscopic Anatomy.*
C. B. DAVENPORT	*Instructor in Zoölogy.*
G. H. PARKER	*Instructor in Zoölogy.*
WALTER FAXON	*Assistant in Charge.*
D. D. SLADE	*Assistant in Osteology.*
SAMUEL GARMAN	*Assistant in Herpetology and Ichthyology.*
WILLIAM BREWSTER	*Assistant in Ornithology and Mammalogy.*
ALPHEUS HYATT	*Assistant in Palæontology.*
SAMUEL HENSHAW	*Assistant in Entomology.*
MISS F. M. SLACK	*Librarian.*
MAGNUS WESTERGREN	*Artist.*
W. S. NICKERSON	*Assistant in the Zoölogical Laboratories.*
W. E. CASTLE	*Assistant in the Zoölogical Laboratories.*
RICHARD ELWOOD DODGE	*Assistant in the Geological Laboratories.*
LEON S. GRISWOLD	*Assistant in the Laboratories of Geology and Physical Geography.*
GEORGE E. LADD	*Assistant in the Geological Laboratory.*
ROBERT DeCOURCEY WARD	*Assistant in Meteorology.*
T. A. JAGGAR, Jr.	*Assistant in Petrography.*

REPORT.

To the President and Fellows of Harvard College: —

During the past year the usual courses of instruction have been given at the Museum in Zoölogy by Professor Mark, Dr. Slade, and Mr. Davenport, assisted in the Laboratory work by Messrs. W. M. Woodworth, H. M. Kelley, and W. S. Nickerson.

Professors Whitney, Shaler, Davis, and Wolff gave courses of instruction in Geology, Palæontology, Physical Geography, and Petrography. Messrs. Harris, Robert T. Jackson, J. B. Woodworth, Griswold, Ladd, Ward, Landes, and Whittle were the Assistants in the Geological Department.

For the details of these courses of instruction, as well as of the summer courses in Geology, I would refer to the accompanying special reports of the Professors and Instructors. I would call special attention to the interesting report of Professor Davis in regard to Physical Geography and Meteorology.

The Newport Marine Laboratory has, as usual, been open to advanced students in Zoölogy. An unusually large number of students have come to Newport this year to collect material for their winter's work. It will, however, be impracticable for me to accommodate so large a number again. Some other provision must be made elsewhere for the less advanced students, — at the Aquarium of the Museum, for instance, — if it is necessary to carry on an elementary summer school of Zoölogy.

We have to thank Colonel Marshall McDonald, United States Fish Commissioner, for facilities granted to our students in connection with their work at the Fish Commission Station at Wood's Holl.

The income of the Virginia Barret Gibbs Scholarship was divided, according to the terms of the gift, among three of the students who spent some of their time at the Newport Laboratory.

We have received during the year an anonymous contribution to be applied to the increase of Dr. Hagen's salary.

As will be seen from the reports of the different departments of instruction, considerable time was spent by the Professors and Instructors in preparing an exhibit for the Columbian Exposition, specially intended to illustrate the methods of instruction, and forming a part of the Harvard University exhibit. The Museum sent plans of the building, prepared under the supervision of Dr. Wolff, who also charged himself with advising the Harvard Camera Club in regard to the views of the most characteristic Exhibition Rooms of the Museum which accompanied them. The plans, and the photographs taken by the Camera Club and by Mr. J. L. Gardner, will be hereafter most useful in the preparation of an extended account of the Museum of Comparative Zoölogy which it is intended to publish at some future time.

Photographs and plans of the Newport Marine Laboratory were also sent to Chicago, as well as a complete series of the publications issued in connection with the Laboratory, and of other publications relating to the Marine Fauna of the United States written by officers of the Museum or naturalists connected with the different deep-sea expeditions sent out by the United States Coast Survey and United States Fish Commission in charge of Louis Agassiz, L. F. de Pourtalès, or myself. Colonel Marshall McDonald kindly took charge of this exhibit, which was placed in the space assigned to the Fish Commission in the Government Building. Duplicate collections of these publications are in the libraries of the United States Coast Survey and of the United States Fish Commission.

We have been able to open the Museum on Sundays throughout the year, the Corporation having assumed the additional expense involved in providing the necessary service. The number of visitors has been greatly increased in consequence, and this has emphasized the need of additional and more general labelling of the collections for the benefit of the public. In the Systematic Collection the larger Mammals have been more prominently labelled, and the same has been done with the North American Mammals. With our limited means, considerable time must elapse before the labelling can be extended to the other rooms and the other classes of the animal kingdom.

I can only repeat what has been stated in former reports, that the increase of the classes in Geology and Zoölogy has been such as to render it desirable that the Geological Department should be accommodated in new quarters to allow for the expansion of the Zoölogical Department. The Geological Department could be housed in the southwest corner piece of the Museum, where large lecture-rooms might also be provided for the use of the Natural History Department. But there seems at present no probability of building such an addition to our building, which would require $100,000 for its erection and equipment.

During the past winter the Pacific Room, though far from complete, has been opened to the public. The most interesting specimens are its marine Mammals, the Seals, Dugong, and Sea Otter; a collection of Birds from the Sandwich Islands, to illustrate one of its characteristic insular faunæ; and a typical collection of Fishes and of Invertebrates, which occupies the central cases of the room.

The Greene Smith Collection of Birds has been placed in the North American Room. New cases have been built to accommodate it, and the whole collection has been carefully examined and thoroughly cleaned by Mr. Clark, who has spent nearly a whole year upon this work. With this addition in place, we have every reason to be satisfied with our North American faunal exhibit.

The additional space devoted to the North American Birds has compelled us to remove the shore marine forms, which up to the present time have formed a part of the faunal exhibits. This has necessitated the rearrangement of the Marine Fishes and Invertebrates, and their removal to the Pacific, Atlantic, and Indian Ocean Faunæ, limiting the faunal exhibits of the Fishes and Invertebrates to the Land and Freshwater types, — a far more consistent geographical arrangement than the former mixture of terrestrial and marine faunal subdivisions. These changes have brought an unusual amount of work upon Mr. Garman, and especially upon Mr. Faxon, who has had the general supervision of this rearrangement. Several of the rooms of the oldest part of the Museum building have been thoroughly renovated.

Although we have received a small Hippopotamus, a few Gazelles, and an African Elephant, we still have some gaps to fill in the African and Pacific Faunal Rooms. The first invoice of material to illustrate the fauna of Japan has safely reached us.

Extensive changes and repairs in the Entomological Department have greatly facilitated the use of the collections, upon which Mr. Henshaw presents his first annual report. The collections of the Museum generally continue in good condition. The reports of the Assistants of the Museum will give the details of the work accomplished, and of the additions to the collections received in their departments during the past year.

Upon Professor Faxon, who has been placed in charge of the collection of Invertebrates, has also fallen the principal share of the care of the Museum as a whole since he began his duties, and the improvement in the general appearance of the Exhibition Rooms is very marked. We are indebted to Professor Hyatt for the care he has given to the Palæontological Collections in his charge, and to Mr. Brewster for his interest in supervising the arrangement of the Greene Smith Collection of North American Birds.

On the 9th of November Dr. Hagen died, in his seventy-seventh year, after a lingering and painful illness of more than three years. Dr. Hagen joined the Museum staff in 1867, and until incapacitated in 1890 he devoted his time and energies to the interests of the institution with which he had cast his lot. In 1876 he refused an urgent invitation to assume the charge of the entomological collection of the University of Berlin, the greatest scientific prize perhaps in his department. He built up the exceptionally interesting biological collection of the entomological department from nothing, and the comparatively small collection of Insects which he found on entering upon his duties he has left greatly increased in size and value. His varied and extensive information was always at the service of the specialists who frequented his laboratory. During his connection with the Museum Dr. Hagen published a great number of papers on entomological subjects. Unfortunately for his influence on the progress of Entomology in this country his publications were usually printed in German.

With regard to the "Blake" publications, two additional memoirs have been published, — a Bulletin on the Northern Atlantic Mollusca collected by the "Blake" during the summer of 1880, by Miss Katharine J. Bush, and an elaborate monograph on the Paguridæ by Professor Alphonse Milne-Edwards and Mr. Bouvier, illustrated with twelve quarto plates. Professor Milne-Edwards has also in hand a final memoir on the Crustacea of the "Blake." This leaves still to be published, of the work on the "Blake" collections, the memoir on the Alcyonaria, by Professor Verrill; the Deep-sea Fishes, by Professor Goode and Dr. Bean; the Comatulæ, by Dr. Hartlaub; and a memoir on Pentacrinus, by Professor H. Ludwig.

Although not published under the auspices of the Museum, I should mention as forming a part of the results of the "Blake" an important paper by Dr. Wiren, on Solenogaster, a great part of which is based on specimens dredged by the "Blake" in 168 fathoms off St. Lucia, in the winter of 1878–79, issued in the Memoirs of the Stockholm Academy of Sciences.

The available bulk of our Pentacrinus material has been sent to Professor Ludwig of Bonn, who has kindly consented to work up this genus from the collections made by the "Blake" in the West Indies.

A number of publications are in preparation in the different Laboratories of the Museum. The following work has been done during the past year on the Collections of the Fish Commission Steamer "Albatross" expedition of 1891. Mr. Westergren has nearly completed the plates (fifty in number) which are to accompany Professor Faxon's memoir on the Crustacea of the expedition. Mr. Faxon has already completed the text, and a preliminary report of the collection has been published in the Bulletin, awaiting the preparation of the plates for the final monograph.

Professor Ludwig also reports that he has completed the monograph on the Holothurians. A preliminary notice was published in the *Zoologischer Anzeiger* and in the Museum Bulletin. Professor Ludwig states that his report is to be illustrated by nineteen plates in all, of which eight will be colored plates. The plates are distributed among different families as follows: Synallactinæ, one plate; Psychropotinæ, five plates; Deimatinæ, five plates; Elpidiinæ, one plate; Dendrochirotæ, two plates; Molpadiidæ, three plates; Synaptidæ, one plate; and Pelagothuriidæ, one plate. The whole of his manuscript has been received, and the last plate is in the hands of Werner and Winter.

Professsor Schimkéwitsch has sent in a report on the Pycnogonidæ accompanied with two plates, Dr. W. McM. Woodworth a Report on the Planarians, with one plate and Professor S. F.

Clarke one on the Hydroids, with three plates. The illustrations of these papers are in the hands of the lithographer.

Mr. Scudder's Report on the Orthoptera of the Galapagos (three plates) has been issued, and a short Bulletin on the Rocks of the Galapagos has been published by Mr. George P. Merrill.

Excellent progress is also reported by Professor Hoyle, Dr. G. W. Müller, Dr. Ward, Dr. Bergh, Mr. Garman, and Professor Studer with regard to the various collections intrusted to their care. Professor H. V. Wilson spent some time at the Museum in examining our collection of Sponges, in preparation for his report on the Sponges of the "Albatross" expedition.

Owing to my prolonged absences from Cambridge, I have myself made little progress with the groups which I had selected to work up; but I hope during the coming year to be able to devote some time to them, and also to take up for publication the large amount of material on the Acalephs of the East Coast of the United States now in my hands. For nearly thirty years since the publication of the Catalogue of North American Acalephs, I have every summer, and frequently during the winter months also, paid a good deal of attention to the Jelly-Fishes of our coast. An immense amount of drawings and of undigested notes have thus accumulated. Their publication, as well as a revision of the papers on the same subject issued up to the present time in the Museum publications and elsewhere, would form an instructive and connected account of the Acalephian Fauna of our shores.

For a complete list of the Publications of the Museum I would refer to Appendix A. Of the Bulletin we have issued during the past academic year four numbers of Volume XVI. of the Geological Series, three numbers of Volume XXIII., completing the volume, and the whole of Volume XXIV. Of the Memoirs, we have issued No. 3 of Volume XIV., completing the volume.

About the usual number of volumes have been added to the Library, either by gift, exchange, or purchase. The number of volumes is now over twenty-three thousand.

As far as the available stock permitted, we have distributed a number of more or less complete sets of our publications to institutions and societies with which we have only lately begun to exchange. It has now become impossible for us to supply complete sets of our publications. Many parts of the earlier volumes both of the Bulletins and Memoirs are out of print, as the demand for certain numbers has far exceeded that for others.

We have purchased from Zeiss a complete microphotographic apparatus; during the summer months it will be available for the Newport Marine Laboratory, and during the rest of the year it will be at the service of the Museum officers.

In addition to the collections of the Albatross expedition of 1891 sent to the various specialists[1] who have kindly consented to work up the material brought together, specimens were sent for examination to Professor Goode and Dr. Bean, to Professor Bütschli, to Dr. Steindachner, to Professor Lankester, to Dr. S. J. Hickson, and to Mr. Bigelow.

To Professor F. Eilhard Schulze was sent our collection of types of Sponges from the deep waters of the Gulf of Mexico and the West Indies. This he has examined and already returned, with notes on the species suggested by his examination of the extensive series of Hexactinellidæ from all quarters now in his hands for monographic purposes.

Our collection of North American Hydroids was sent to Dr. Camille Pictet, to be used in preparing a monograph on the Hydroids of the Bay of Naples for the Zoölogical Station. This collection reached Switzerland a few days before Dr. Pictet's death, and it has been returned by the authorities of the University of Geneva.

I hear from Professor Dupont that excellent progress is making with the cast of the Iguanodon which is to be sent from the Brussels Museum to Cambridge.

Arrangements have been made with Dr. Dohrn by which one of the tables of the Zoölogical Station at Naples has been placed at the disposal of the Faculty of the Museum for three years. The conditions upon which the table is assigned are shown in Appendix B, and a notice[2] of this has been sent to all the Universities and Colleges of the country, as well as to specialists interested in the study of Marine Zoölogy. I regret to say that thus far the number of applications has been most limited, and there does not appear to exist the imperative demand for the maintenance of the table represented by American zoölogists. The Smithsonian Institution has also undertaken to supply this need for American students. The Faculty of the Museum nominated Professor Meek of Fayetteville, Arkansas, as the incumbent of the table for the coming winter, and this nomination has received the approval of the Corporation.

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[1] A list of the persons who are preparing the Reports will be found on the third page of the cover of this Report, with the list of the publications of the Museum now in preparation.

[2] Professor James D. Dana was kind enough to give this notice the benefit of an insertion in the American Journal of Science.

During the past winter I spent three months exploring the Bahama Banks in the steam yacht "Wild Duck," which my friend, the Hon. John M. Forbes, was kind enough to place at my disposal for the purpose.

Mr. J. H. Emerton and Mr. A. M. Meyer accompanied me as draughtsmen and assistants. On our return to Nassau, after exploring the Great Bahama Bank and the shore of Cuba from Santiago de Cuba to Havana, I sent a short account of the progress of the expedition to Professor James D. Dana for publication in the American Journal of Science. Subsequently, we examined the Little Bahama Bank, and I am now preparing an account of the expedition for the Bulletin. I have to thank Colonel Macdonald, the U. S. Fish Commissioner, for the use of some deep-sea thermometers and of a Tanner sounding machine. Professor Mendenhall, the Superintendent of the Coast Survey, was kind enough to appoint me Acting Assistant of the Coast Survey, as I had been already on former occasions while attached to the "Blake," in order to enable him to assist the expedition in various ways and to give it an official character. I have specially to thank the Hon. J. W. Foster, the Secretary of State, and Mr. Wharton, the Assistant Secretary, for securing the interest of the Spanish Minister at Washington, and the kind offices of the Captain General of Cuba in procuring for the "Wild Duck" free entrance to all ports of the Cuban coast, as well as the assistance of the naval authorities and of the governors of the various provinces which we visited. To Captain J. W. Wharton, the Hydrographer of the Admiralty, as well as to Lieut. Commander Richardson Glover, U. S. N. Hydrographer, I am also indebted for valuable information regarding the Bahamas. The cruise of the "Wild Duck," while not as successful as I hoped on account of the unusual violence of the trades, yet accumulated important information on the structure of the islands and banks, their geological history, and the theory of coral reefs. The pelagic fishing, both at the surface and at moderate depths, which I hoped to make an important feature of the expedition, was quite limited, owing to the continuous unfavorable weather we encountered. Still we made sufficient use of the deep-sea Tanner towing-net to confirm in general the results at which I had arrived while on the "Albatross," in 1891, regarding the limited bathymetrical range of the pelagic fauna. I may mention as one of the interesting catches a pelagic Amphioxus, of which the specimens we collected were sent to Professor Lankester for examination. Mr. Meyer devoted his time mainly to the study of the Acalephs collected during our trip.

To Dr. Theo. W. Richards, and to Mr. Churchill of the Class of 1893, I am indebted for many analyses of the rocks and bottoms, and to Professor Wolff for kindly preparing slides of some of the more interesting æolian rocks from the Bahamas. The report of this reconnoissance of the Bahamas is well under way.

It is hoped that some arrangement may yet be made between the representatives of the leading Universities and the Fish Commissioner by which the exceptional facilities for marine research now existing at the Fish Commission Station at Wood's Holl may be made available for original investigation. It has been suggested that the Commission should continue to carry on the station as it now does, and supply to capable naturalists representing the Universities or independent specialists the mass of material which it cannot afford to have worked up. The Fish Commission can hardly be expected to devote any part of its limited appropriation on expenditures which have no direct bearing on the practical side of the fishery question. An extensive and expensive plant has been built up at Wood's Holl, which it seems useless to duplicate. It is more than is needed for the purposes of the Fish Commission. At least twenty persons properly qualified could be supplied with all they need for original work, provided these persons represented an outside interest able to carry on those investigations which are not directly in the line of the work of the Fish Commission, but which yet may prove of great value to it. By allowing the leading Universities to subscribe to a fund which should be sufficiently large to relieve the Commission of its purely scientific work, and to afford sufficient means for its publication, fifteen such subscribers might be found to bring together such a fund, and leave five places open to non-subscribers, to be filled by the governing board of the Station.

A governing board consisting of representatives of the government bureaus interested in subjects kindred to those of the Fish Commission, together with appointees of the subscribers from the leading Universities, might form a board of trustees empowered by Congress to carry on the Wood's Holl Station for the best interests of the Fish Commission and of the different branches of science connected with marine explorations. The vessels under the control of the Commission would, as far as practicable, also be available for the general purposes both of the Commission and of the scientific investigators. Such a combination as that suggested above would in no way interfere with the marine laboratories now or hereafter to be connected with the different Universities. The Wood's Holl Laboratory would be a permanent station, occupied during the whole year by the officers of the Fish Commission and the Scientific Director, and in addition to the central station well equipped laboratories would soon be established for all branches of the scientific investigation of the sea; and these permanent laboratories in their turn would be supplemented by expeditions of greater or less duration in the vessels connected with the Fish Commission. Should such a central station be found to work well, it would have a fair claim for support both from the government and the public.

A beginning might be made by securing an annual sum of five thousand dollars for five years from the Universities interested in this work, and a plan prepared to be presented to Congress for their approval. The position of the laboratory at Wood's Holl, and its connection with a government bureau, are perhaps the only drawbacks to enlisting the interest of Universities in the proposed scheme.

There will of course be some difficulty in devising a practical plan of co-operation between the Fish Commission and the representatives of the purely scientific interests of the country. The distance of Wood's Holl to the open Atlantic is also a very serious drawback. During the summers which I spent at Wood's Holl, my experience was that, while the shore fauna is perhaps as varied as that of more exposed parts of the adjoining coast, it is far less productive so far as the pelagic fauna is concerned which forms so great a share of the material of a marine laboratory. But with an ample equipment of sea-going launches and of larger boats such as are controlled by the Fish Commission, this is not a very serious difficulty. The expense of living at Wood's Holl is practically neither greater nor less than at other New England summer resorts.

I regret to report that the Visiting Committee of the Museum appointed by the Overseers have been unsuccessful in their efforts to obtain funds for some of the most pressing needs of the Museum. The committee have shown the greatest interest in attempting to supply the deficiencies to which their attention had been called by the reports of the Professors and of the Curator of the Museum.

Mr. W. E. D. Scott, who is greatly interested in the progress of ornithology in this country, is making the attempt to collect funds for an additional exhibition room of birds. The collection he proposes to bring together is to be modelled on the plan of exhibition which has been introduced with great success in the British Museum, and to a limited extent in the National Museum at Washington. The plan embraces isolated cases of mounted birds, representing single species as life-like and at the same time as artistically mounted as possible. Next, cases illustrating the variation of such species as are non-migratory, but which range uninterruptedly over large geographical areas. Next, cases showing the dichromatic phases occurring in many families, as well as cases showing the various phases of appearance in any given species correlated with sex, season, age, etc.

There are many problems of a similar nature which have been brought into prominence during the past thirty years. Many of them can be illustrated in a satisfactory way to the public by exhibits of the different classes of the animal kingdom. The greater familiarity of the visitors with birds and insects will make it comparatively simple to explain to them the object of a limited exhibit of these classes. As regards the more general questions of development, and the multitude of minor problems which it would be interesting to place before the public, other classes must be selected, and the Director of any public Museum will only be at a loss to know what to exclude from the limited room usually at his disposal, so as not to occupy his available space with exhibits which, however interesting to the student, will only have a limited interest for the average visitor.

ALEXANDER AGASSIZ.

CAMBRIDGE, October 1, 1893.

REPORT ON THE COURSES OF INSTRUCTION IN GEOLOGY.

By Professors J. D. Whitney, N. S. Shaler, W. M. Davis, Assistant Professor J. E. Wolff, and Dr. T. W. Harris.

During the Academic year 1892–93, the following named courses of instruction were given in the laboratories and in the field by the instructors of the Department of Geology.

Instruction in General Geology.

1. (Geol. 4.[1]) A half-course in Elementary Geology; two lectures a week by N. S. Shaler, with one hour for special exercises, conducted by R. E. Dodge and L. S. Griswold, and with required reading in Dana's Manual of Geology. In the spring, voluntary excursions were made to points of geological interest in the vicinity of Cambridge under the guidance of the assistants. The course was attended by two hundred and eleven students.

2. (Geol. 5.) A half-course in Practical Geological Exercises in the laboratory and in the field, requiring two two-hour exercises a week, with occasional lectures: by T. W. Harris, assisted by G. E. Ladd; designed especially for those who intend in subsequent years to continue the study of Geology and Palæontology. Attended by fifty students.

3. (Geol. 8.) A course in General Critical Geology, two lectures a week, and for a part of the year three, by N. S. Shaler; with an additional hour for review of assigned reading and for conference, conducted by J. B. Woodworth. Lyell's Principles of Geology was read parallel with the lectures. During the autumn and spring months, eight half-day excursions were made in the field in the vicinity of Cambridge, under the guidance of J. E. Wolff and J. B. Woodworth. During the winter months, theses were prepared on subjects chosen with the advice of the instructors. Those only who passed a satisfactory examination in the elementary courses were permitted to take the course. Thirty students received this instruction.

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[1] These abbreviated names of courses correspond to those given in the "Announcement of Courses of Instruction," issued by the Faculty of Arts and Sciences.

4. (Geol. 9.) A course in the Structural and Dynamical Geology of the Stratified Rocks, by T. W. Harris. Two conferences a week, with required reading and theses. This course was attended by eight students.

5. (Geol. 18.) A course in Economical Geology, by J. D. Whitney. Lectures twice a week, with required readings and theses. Attended by thirty students.

6. (Geol. 22.) A course in Field-work and Geological Surveying, designed to afford special training in original investigation, with work in the library and in the preparation of geological reports, under the direction of N. S. Shaler, W. M. Davis, J. E. Wolff, and T. W. Harris. Conferences were held once a week during the year. This course is open only to those who have attained satisfactory grades in Courses 8, S. 2, and in either Chemistry C or 2. It was attended by eighteen students.

Instruction in Petrography.

7. (Geol. 12.) A course in Petrography, by J. E. Wolff, assisted by C. L. Whittle. Two lectures a week, with laboratory work, theses, and field-work. Attended by sixteen students.

8. (Geol. 23.) A course in Petrographic Research, by J. E. Wolff. Field and laboratory work. Attended by five students.

Instruction in Palæontology.

9. (Geol. 14.) A course in Palæontology, by N. S. Shaler, assisted in the laboratory by R. T. Jackson. Two lectures and four hours of laboratory work a week, with theses. This course was attended by twenty-three students.

10. (Geol. 15.) A course in Historical Geology, designed to train advanced students in the use of fossils in determining geological horizons, by N. S. Shaler, assisted by R. T. Jackson. This course was taken by five students.

11. (Geol. 24.) A course in Palæontological Research, under the direction of N. S. Shaler, assisted by R. T. Jackson. Attended by one student.

Instruction in Meteorology and Physical Geography.

12. (Geol. 1.) A half-course in Elementary Meteorology, by W. M. Davis, assisted by R. DeC. Ward. Two or three lectures a week, with laboratory work and recitations, first half year. Attended by seventy-three students.

13. (Geol. 2.) A half-course in Physical Geography, by W. M. Davis, assisted by R. DeC. Ward. Two or three lectures a week, with

laboratory work and recitations, second half-year. Attended by one hundred and two students.

14. (Geol. 20.) A course in Advanced Meteorology and Physical Geography, by W. M. Davis. Conferences held once a week. Attended by eleven students.

Instruction in Summer Schools.

15. (Geol. S. 1.) An elementary course in General Physical Geology. This course was given in Cambridge, beginning Wednesday, July 5th, and closing Friday, August 11, 1893, under the direction of T. W. Harris. The instruction, primarily intended to meet the needs of those who intend to take the second summer course and the second course during term time (Geol. 8), was adapted also to the needs of teachers. Lectures and laboratory work occupied the forenoon of each day of the session, and short excursions to localities of geological interest were taken in the afternoon. This course was attended by fifteen students, of whom ten are students in the University.

16. (Geol. S. 2.) A more advanced course in geological field-work was given at different points in Eastern New York and Connecticut, commencing Monday, August 14, and lasting six weeks, closing Saturday, September 23d. The class assembled at Utica, N. Y., under the direction of T. W. Harris. On August 28th it moved to Catskill, N. Y., and there remained until September 9th. On September 11th the class went to Meriden, Conn., where the remainder of the time was spent, under the charge of L. S. Griswold, in a study of the Triassic sandstones and trap-sheets. Eleven students took this instruction, all of whom are students in the University.

17. (Geol. S. 3.) A course in independent field investigation and geological surveying, under the supervision of the officers of the Department. One student was engaged in this work upon the Pleistocene deposits of Eastern Connecticut.

Additional Instruction.

18. During the year the students in the advanced courses attended regular Tuesday evening meetings in the Geological Laboratory, which were designed to serve the purpose accomplished by the Seminaria of the German Universities. A number of the papers read at these conferences have been announced in the College Calendar. Outside of the papers presented by members of the University, one was read by Mr. Warren Upham relating to a theory of the origin of Drumlins.

19. (Geol. 26.) A half-course on Geographical Methods and Results. One lecture a week, by J. D. Whitney. Attended by thirteen students.

REPORT OF THE STURGIS-HOOPER PROFESSOR OF GEOLOGY.

By Professor J. D. Whitney.

During the past year (1892–93) two courses of lectures were given by the Sturgis-Hooper Professor. The first of these was geographical, and was attended by about fifteen students, mostly Graduates and Seniors. The object of this course was to give an outline of the progress of geographical science, beginning with the very earliest times, and having special reference to the methods by which this kind of information has been obtained and represented, on paper or otherwise, so as to be available for practical use. This course was comprised in about thirty lectures, and brought the subject down to the circumnavigation of the globe by Magellan. In the libraries of the University there is a large amount of illustrative material for a course of this kind, which could very properly and profitably have been expanded to twice the length attempted.

The second course, which was attended by about thirty students, was devoted to the economical geology of the metals and their ores, and included brief sketches of the methods of mining, ore-dressing, and smelting. This course is simply a continuation of one given the previous year on economical geology in general, which, however, was devoted to the non-metalliferous minerals exclusively. As matters are now arranged, it seems best to make a permanent division of the subject of Economical Geology into two courses of lectures and study, these to be given in alternate years. The first course will be devoted to the non-metalliferous minerals, the second to the metals and their ores, each of these courses to run through the entire College year. The object of these courses is, to give the student an opportunity to acquire such an amount of general knowledge of the subject of economical geology as will be useful both to those who are not intending to make a specialty of mining, and to such persons as, having this object in view, may desire to have at least so much superficial knowledge of the subject as will be useful to them in arranging their future studies in this line of work, and in selecting a place where these studies can be pursued.

Chiefly to aid students in Economical Geology, certain chapters in the "United States: Facts and Figures illustrating the Physical Geography of the Country and its Material Resources," published in 1889, and which have special reference to the subjects treated in the courses indicated above, have been rewritten, considerably amplified, and brought down to the latest available date. These chapters, which will be published separately, are now being printed, and will be available for reference during the coming College year, 1893–94.

REPORT ON COURSES IN GENERAL GEOLOGY AND PALÆONTOLOGY.

By Professor N. S. Shaler.

The course in Elementary Geology (Geol. 4) maintained during the year the special meetings in small sections instituted in the previous year and commented upon in the last Report. The aid of an additional Assistant in the course rendered the work of instruction more effective than it has heretofore been.

In the advanced course in Geology (Geol. 8) the plan of assistance employed in the previous year was also pursued. The field work was slightly increased by the addition of exercises in geological surveying, undertaken by each student on an assigned area of one square mile. In order to make the most of the limited time which our students can command for field work, their attention was directed to a discrimination and survey of the pleistocene deposits of the country adjacent to the College. The result of this work has been the preparation of twenty-eight maps covering as many square miles. The correctness of the maps and the progress of each student has been gauged by means of a manuscript map already prepared, and by visits to particular localities.

In the work of palæontological instruction, Dr. Jackson continued to bring the collections into a more extended use by the students, and a large amount of time was spent in improving the condition of the teaching collections. The laboratory work is now considerably hindered by the want of room.

A machine for cutting and grinding fossils was added to the equipment of the Department. It is placed in the Petrographical workshop, and is run by electric power with which that department is supplied.

Mr. A. Agassiz very kindly gave the department a fine specimen of the recent *Pentacrinus decorus*, in alcohol, which will be an invaluable accompaniment to fossil types. Considerable palæontological material was received from the Museum as a gift or in exchange.

A collection illustrating typical fossils of the New York State rocks was received from the New York State Museum, at Albany, through the kindness of Professor John M. Clarke. For this collection an exchange will be returned. Thanks are due to Mr. H. L. Jones for a collection of fossils illustrating the Waverly Group of Ohio. Considerable material was purchased from Ward's Natural Science establishment at Rochester, and material was obtained by purchase, exchange, or gift from several other sources.

The thanks of the Department are due to Miss Mary L. Ware, of Boston, who generously gave one hundred dollars to the Palæontological section. With this recent gift much important material has been purchased.

A few necessary palæontological books were purchased for the laboratory. Thanks are due for a number of technical papers received from their authors. Especially to be mentioned are nearly complete sets of their publications, given by Professor Alpheus Hyatt, and Dr. E. C. Beecher of New Haven.

Arrangements have been made to employ the electric arc-light with a magic lantern in the Geological Lecture Room, in place of the gas-light heretofore used. By the transfer of a number of duplicates of government geological reports from the Museum Library to the Department, means have been provided for perfecting the preparation of theses in Geology 8, the books being at present reserved for the use of students in this course. During the year, the usual number of rock specimens were added to the teaching collection to replace worn or undesirable material.

The work of cataloguing the collection of photographs belonging to the department was advanced by Mr. J. V. Lewis. Through the generosity of Mr. J. L. Gardner, the department has a fund of $5,500 devoted to the augmentation and care of this means of instruction, which it has been voted by the Corporation to call the "Gardner Collection of Photographs."

During the winter and early spring much time was given by the officers of the Department to the preparation of exhibits of our means of instruction for the World's Columbian Exposition at Chicago. A special edition of the General Account of the Department has been issued, in which these exhibits are fully described. The preparation of this exhibit has made felt the want of illustrative material in the form of rock collections, maps, and models, particularly in Course 8.

The Commonwealth of Massachusetts has called on the Professor of Geology for service in three boards: the Commissioners of the Topographical Survey, the Commissioners of Highways, and a committee of the State Board of Agriculture charged with the extermination of the *Ocneria dispar*, or Gypsy Moth. These duties have demanded a considerable part of his time, and have necessarily diminished the amount of research work which should otherwise have been done. He has also been much engaged in supervising and directing the work of several assistants in the Atlantic Coast division of the United States Geological Survey.

REPORT ON THE PETROGRAPHICAL LABORATORY.

By Assistant Professor J. Eliot Wolff.

The instruction in Elementary Petrography was attended by fifteen students. The usual lectures were given twice a week, supplemented by a large amount of laboratory work. Mr. C. L. Whittle was appointed assistant by the Corporation, and gave the instructor much needed aid in the care of the laboratory and the more systematic arrangement of the laboratory work.

Six students pursued advanced work in Petrography, and made original investigations in the following subjects, among others:—

The Felsites of the Boston Basin.
The Schistose Bombs of the Laacher See, in the Hubbard Collection.
A Basic Dike in the Connecticut Triassic.

During the winter extensive improvements were made in the geological workshop in the basement, and in the arrangements for illumination and projection in the Petrographical Lecture Room upstairs, and in the large Geological Lecture Room. The increasing size of the classes and large amount of mechanical work done by them and other students of geology, in slicing and polishing rocks and fossils and preparing thin sections, made the use of power desirable, and almost necessary. A five-horse power electric motor was therefore placed in a corner of the Chemical Laboratory in the basement, and the shafting carried through the wall to the adjoining workshop. From this a lathe is run carrying the vertical tin disk charged with bort for sawing rocks, and three other lathes with horizontal revolving iron or zinc plates for grinding and polishing rocks and sections through the different stages. A useful saving of time and labor is thus gained over the old method of working by foot and hand power.

At the same time a one-kilowatt, 55-volt dynamo is run from the motor by suitable shafting, and the current carried to the two lecture-rooms on heavily insulated wire with all possible precautions. In the Petrographical Lecture Room this is utilized alternately for illuminating the room by incandescent lights and by means of a 2,500 c. p. arc lamp for microscopic projection or photo-micrography with the large Zeiss apparatus placed there. In this way brilliant projections of thin rock sections are shown to the class in illustration of the lectures; and for the ordinary screen projection of photographs by lantern slides the same apparatus is eminently satisfactory, especially since, owing to the great power of the lamp, the projection can take place by daylight or by partial darkening of the room.

The instructor has continued during the year his work on the Archæan of the New Jersey Highlands, and in the preparation of a monograph on the Crazy Mountains of Montana.

An exhibit in Petrography was prepared for the Chicago Exposition as part of the contribution of the Department of Geology to the general exhibit of Harvard University, comprising illustrations of the methods of laboratory work and material for lecture illustration, examples of the collections, etc.

REPORT ON THE LABORATORY OF PHYSICAL GEOGRAPHY.

By Professor W. M. Davis.

Instruction in Physical Geography and Meteorology has been continued on the same plan as in former years; the intention being to give under the first heading a general account of the oceans and a more particular account of the meaning and development of land forms and their relation to habitation; and under the second heading, an understanding of the arguments on which the acceptance of the modern physical theories of meteorology are based. The instruction in these elementary courses was given in the form of lectures delivered in the large Geological Lecture Room, supplemented by exercises in the Laboratory on the fourth floor. Written and verbal tests were required nearly every week under the two instructors, besides the usual final examinations.

The lectures, particularly those on Physical Geography, received frequent illustration by the lantern, for which our growing collection of slides gives abundant means. The laboratory exercises were based, much as in previous years, on the special collection of maps and models formed for this purpose and still increasing. The paper models, described in previous Reports, are still in constant use in the Laboratory; although it is now desirable that a new edition of them should be prepared, not only thus better to meet our own needs, but also to be able to supply the demand for the models that comes from other colleges. At present the series is not duplicated for sale or exchange. The employment of a capable assistant to revise the models is greatly desired.

An almost equal use is made of the large-scale topographic maps of our own and of foreign countries, of which the Laboratory contains an extended collection, apart from the much larger collection in the University Library, which is referred to below. In most cases these maps are prepared for students' use by mounting together a group of sheets, representing some chosen district. Besides many examples that might be mentioned from our own country, the following may be cited from abroad: the longitudinal forms of the Austrian coast of the Adriatic, the transverse forms of the coast of southwestern Ireland, the straight-lined coast of southwestern France, the dissected plateau of northwestern France, the rugged highlands of Scotland, the lacustrine lowland of Finland, the fluviatile plain of Hungary, etc. It is found in teaching that these large-scale maps supply an essential supplement to even the best physical wall maps, such as Kiepert's. The latter show the general form of a country as a whole, yet they fail to represent its physical features with exactness; but the former remedy this deficiency, and enable the student to recognize almost the smallest details of geographical form. Their use has greatly improved the quality of our teaching. It is believed that the knowledge of the value of accurate maps thus gained by our students will contribute to establishing an interest in the continued preparation of accurate and large-scale maps of our own country.

The advanced course in Physical Geography and Meteorology is, as in previous years, still carried on chiefly through informal class conferences, but partly also in individual meetings. This course was attended by eleven students, of whom five were Graduates and five Seniors. The subjects studied were: the physical features of Missouri, Arkansas, and North Carolina, by Messrs. Clendenin, Griswold, and Harris, based on personal observation in these States, as well as on a review of what has been written about them: the physical features of Middle England, by Mr. Moore; the development of river terraces, by Mr. Dodge; the features of our eastern coast line, by Mr. Hill; foreign studies of thunder-storms, by Mr. Ward; maps of annual and seasonal temperature anomalies, by Mr. Batchelder, and of equal annual temperature ranges, by Mr. Connolly, these being based on Buchan's "Challenger" charts. Mention may be made in this connection of two models constructed under my direction by Mr. Gulliver; one showing the Newtonville glacial sand-plain in its present condition, and the other restoring it as it presumably existed in the closing stages of the glacial period Some of the essays prepared by these students will be published during the coming year.

Some beginning has been made on a project to form a teaching collection of photographs and lantern slides, with which to illustrate the geology and geography of our several States. Besides a considerable number of excellent views obtained by gift, the income of the Gardner Fund, supplemented by the general laboratory funds, enables us to purchase practically all the good photographic illustrations of geographical and geological features that we can find for sale. Most of the photographs have now been catalogued and classified, in order to show not only what we have, but what we want as well. Correspondence has been opened with a number of photographers in different parts of the country, and with the officers of certain State geological surveys, in order to extend our collection in certain desired directions. It is believed that in a few years we shall be able to select from this large amount of material a series of graded collections of much educational value, thus extending the usefulness of the University in this direction beyond its immediate classes.

It is noticeable, however, that in spite of the ease with which good photographs are now taken, it is still difficult to obtain a well selected series of views properly illustrating the characteristic features of any State. The attempt has therefore been made, through an address to the National Geographic Society, to turn the attention of our State surveys to the subject of a geographical examination of their domains. It is indeed a curious fact, that, while the geological accounts of our States have advanced greatly, the descriptions of the more elementary subject of their geography are still scanty. Such as they are, they may generally be found in the State or national geological reports; but most of them fall far short of what they should be in the light of modern geographical study. Just as the State surveys have specialized their work in the direction of palæontology and later of petrography, it is hoped that the next few years may see a specialization by the surveys in the direction of geography, in the hands of trained experts, as other technical subjects are. There is encouragement to think that some of the surveys will at once proceed to the development of this line of study. If so, a decided improvement in local geographical teaching may be looked for through the reports that shall thus be prepared. At present, school teachers have practically no source of information outside of ordinary text-books to which they may turn for accounts of the physical features of their home districts; but such accounts might be well supplied through the illustrated geographical reports published by the State surveys.

The special appropriation allotted by the Council of the University Library for the purchase of large-scale topographical maps has been increased from $300 for the year 1891–92 to $350 for the current year, and in this way our collection of modern maps has been most serviceably enlarged. The University Library previously possessed in the Kohl collection a large number of older maps of great historical interest, but of practically no value in teaching physical geography. When the recent purchases began, the only considerable topographical maps in the Library were the Ordnance Survey of Great Britain, the État Major and the Public Works maps of France, the Dufour and the plane-table maps of Switzerland. Since then, the topographical maps of the Netherlands, Belgium, Norway, Germany, Saxony, Austria, Italy, and Spain have been secured. It is hoped that the appropriation for this purpose may be continued for several years to come, as all of the best geographical material of the world can then be placed before our students.

There has been opportunity of extending the relations of the geographical section of the University with the public schools in several ways. In the summer of 1892, an address was delivered before the American Institute of Instruction at Narragansett Pier, R. I., on Geographical Illustrations, and repeated before the Middlesex Teachers' Association and the Bristol County Teachers' Association in the autumn. The object of the address was to emphasize the importance of using various means of illustration, such as maps, models, views, diagrams, etc., in teaching geography. It has since then been published by the University as a reprint from the Proceedings of the Institute. During the year, a course of lectures on Geography was given to teachers; this being one of three courses of lectures, on Geometry, Physics, and Geography, offered by the University to the teachers of the Cambridge public schools. In this way sixty or seventy of the teachers from the grammar schools met in our large Geological Lecture-Room once a week, from November to April.

During the Christmas recess the writer attended a conference of ten members, appointed by a special committee of the National Educational Association, and held in Chicago, to consider the teaching of geography and related subjects in the secondary schools. A report on the work of the conference will be duly published. A sub-committee was appointed by the geographical conference, consisting of Mr. C. F. King of the Dearborn Grammar School, Boston, Professor G. L. Collie, of Beloit College, Wisconsin, and the writer, to prepare a list of governmental maps that might be advisably used in geographical teaching. The committee met in our Laboratory in June, and made a selection of about two hundred maps and charts from among those published by our various official surveys. This list will be shortly published, with indications of the means of obtaining the maps, and with some account of the features that they illustrate. It is believed that the list may have a beneficial effect on the teaching of geography in the schools.

The field study of the Triassic area of Connecticut, mentioned in my previous reports as having been undertaken for the United States Geological Survey, has been finished during the past year, with the assistance of Mr. L. S. Griswold. Mr. Griswold has also completed a colored map of the district on the topographical sheets of the survey, and has prepared a number of true-scale sections, on which, after plotting the various fault-lines by which the formation is frequently dislocated, he has indicated the inferred depth of the deposits underground, and has restored the portion lost by erosion above ground; he then reversed the movements on the fault-lines, and thus returned the dislocated blocks of each section to their original positions, as nearly as can be determined; producing an excellent illustration of the trough in which the Triassic sandstones and lavas were accumulated.

Much spare time has been given during the past two years to the completion of a text-book of Meteorology, which is now in the printer's hands. It will be ready for use with the class in Elementary Meteorology, in the second half of the current year.

Besides the share that Mr. Ward has had in the work of the elementary courses, he has carried on a special study of thunderstorms in New England for the National Weather Bureau, and has continued in the editorship of the "American Meteorological Journal," of which mention was made in the last Report. Finding that the preparation of the Journal calls for an increasing share of his time, he proposes to withdraw from certain of his other duties for the coming year, and devote a greater part of his time to editorial work.

PUBLICATIONS BY MEMBERS OF THE GEOLOGICAL DEPARTMENT.

THE following papers of a scientific nature have been published during the year.

By N. S. Shaler: —

1. The Conditions of Erosion beneath Deep Glaciers, based upon a study of the Boulder Train from Iron Hill, Cumberland, R. I. Bull. Mus. Comp. Zoöl., XVI. No. 11, pp. 185–225. January, 1893. 4 plates, 1 map.
2. The Interpretation of Nature. Houghton, Mifflin & Co., Boston and New York, 1893. 16mo., pp. xi., 305.
3. Report on the Work done in the Atlantic Coast Division of the U. S. Geological Survey for the Year ending June 30, 1890. Eleventh Annual Report of the Director of the U. S. Geological Survey, Part I. pp. 62–64. Washington, D. C., 1891.
4. Report of the Commission to improve the Highways of the Commonwealth of Massachusetts. Boston, 1893, pp. 238. [With Geo. S. Perkins and W. E. McClintock.]
5. On the Antiquity of Man in North America. Amer. Geol., 1893, XI. pp. 180–184.

By W. M. Davis: —

1. Geographical Illustrations. Suggestions for teaching Physical Geography, based on the Physical Features of Southern New England. An Address delivered at Narragansett Pier, R. I., July 6, 1892. Proc. Amer. Inst. Instruction; also reprinted and for sale by the University.
2. The Extension of Physical Geography in Elementary Teaching. An Address delivered before the Middlesex Schoolmasters' Club in Boston, October, 1892. School and College, December, 1892, I. pp. 599–608.
3. Geography in the Schools. School Review, June, 1893, I. pp. 327–339.
4. The Improvement of Geographical Teaching. Nat. Geogr. Mag., July, 1893, IV. pp. 68–75.
5. The Subglacial Origin of Certain Eskers. Proc. Bost. Soc. Nat. Hist., 1892, XXV. pp. 477–499.

6. The General Winds of the Atlantic Ocean. Amer. Met. Journ., 1893, IX. pp. 476–488.

7. Brief Meteorological Articles: — Proposed Subjects for correlated Study by State Weather Services. Amer. Met. Journ., 1893, X. pp. 68–74. Notice of H. F. Blandford, Ibid., pp. 74–76. Cloud Measurements at Blue Hill Observatory, Ibid., pp. 107–109.

8. The Convex Profile of Bad-Land Divides. Science, Oct. 28, 1892, p. 245.

9. The Topographical Maps of the United States Geological Survey, Science, April 28, 1893, pp. 225–227.

10. The Geologic Atlas of the United States. The Nation, Jan. 19, 1893, pp. 45, 46.

11. Lunar Craters. [Review of "The Moon's Face," by G. K. Gilbert.] The Nation, May 11, 1893, pp. 342, 343.

12. Special Students in Harvard College. Harv. Grad. Mag., 1893, I. pp. 536–541.

13. Articles on (Lake) Agassiz, Bad-lands, Beach, (Lake) Bonneville, Cañon, Cataracts, Cave, Cliff, Coast, Colorado River, Coral Islands, Delta, Deserts, Dune. Johnson's Universal Cyclopædia, New York, 1892, Vols. I. and II.

By J. E. Wolff: —

Acmite Trachyte from the Crazy Mountains. Bull. Mus. Comp. Zoöl., XVI. No. 12, April, 1893, pp. 227–233. [With R. S. Tarr.]

By T. W. Harris: —

1. Mountains as Storm-breeders. Amer. Met. Journ., X. 1893, pp. 126–131.

By R. T. Jackson: —

Beecher's Studies of the Brachiopoda. Amer. Nat., XXVI. 1892, pp. 837, 838.

By R. DeC. Ward: —

1. Thunderstorms in New England during the Year 1887. American Meteorological Journal, IX. pp. 211–215.

2. The First Aerial Voyage across the English Channel, Ibid., IX. pp. 307–311.

3. Recent Foreign Studies of Thunderstorms, Ibid., IX. pp. 532–541, X. pp. 111–126, 178–184.

4. Thunderstorms in New England during the Years 1886 and 1887. Annals Astronomical Observatory of Harvard College, XXXI. Part II. pp. 261–343.

5. Investigation of Thunderstorms in New England. In Report on the Forecasting of Thunderstorms during the Summer of 1892,

by N. B. Conger. United States Department of Agriculture, Weather Bureau, Bulletin No. 9, 8vo, Washington, 1893, pp. 30–50.

6. Our Immigration Laws: What they are and what Changes should be made in them. The Boston Commonwealth, July 15, 1893.

7. Edited: The American Meteorological Journal, an Illustrated Monthly devoted to Scientific Meteorology and Allied Branches of Study, 8vo, Ginn & Company, Boston, Mass., Publishers.

By J. B. Woodworth: —

1. The Ice-wall on the Beach at Hull, Mass., January, 1893. Science, Feb. 10, 1893, XXI. pp. 71, 72 (3 figs.).

2. Feeding-lines of a Living Land Gasteropod on Lichened Slate. Science, March 24, 1893, XXI. p. 159.

3. Spirula fragilis found on the Beach near Gay Head, Mass. The Nautilus, February, 1893, VI. pp. 119, 120.

4. Subjects for Theses, with leading References to the Literature. Department of Geology, Course 8, Bulletin VII. Published by the University. pp. 15.

5. Notes on the Wood or Fallow Ant of Southeastern Massachusetts. Science, Sept. 8, 1893, XXII. pp. 132, 133.

By L. S. Griswold: —

Whetstones and the Novaculites of Arkansas. Annual Report of the Geological Survey of Arkansas, 1890, Vol. III., Little Rock, Ark., 1892, pp. xviii., 443, with 9 plates and 2 maps.

A Basic Dike in the Connecticut Triassic. Bull. Mus. Comp. Zoöl., August, 1893, XVI. No. 14, pp. 239–242, with 1 plate.

By C. L. Whittle: —

1. Some Dynamic and Metasomatic Phenomena in a Metamorphic Conglomerate in the Green Mountains. Bull. Geol. Soc. Am., Feb., 1893, IV. pp. 147–166, with 2 plates.

2. An Ottrelite-bearing Phase of a Metamorphic Conglomerate in the Green Mountains. Amer. Journal Sci., Oct., 1892, XLIV. pp. 270–277.

By R. E. Dodge: —

1. The Moon's Face, by G. K. Gilbert. [A review.] Amer. Met. Journ., 1893, X. pp. 126–131.

REPORT ON THE INSTRUCTION IN ZOÖLOGY.

By E. L. Mark.

The instruction in Zoölogy during the Academic year 1892–93 has been substantially the same as that of the previous year, the only exception being a change in the course in Osteology by Dr. Slade, which is now conducted as a research course (Zoöl. 20 *c*).

The accompanying table shows the number of students by classes in each of the zoölogical courses: —

Class.	Gr.	Sen.	Jun.	Soph.	Fr.	Sp.	Sc.	Total.
Zoöl. 1	6	6	8	21	24	7	19	91
" 2	5	7	6	8	1	. .	9	36
" 3	6	8	3	1	. .	. .	4	22
" 4	5	6	1	. .	. .	. .	3	15
" 5	6	6	1	. .	. .	. .	2	15
" 20 *a*	12	. .	. .	. .	. .	. .	. .	12
" 20 *c*	2	1	. .	. .	. .	. .	1	4

The laboratory work in Zoölogy 1 was under the immediate supervision of Mr. H. M. Kelly, the Assistant during the previous year, who had as sub-assistants Dr. H. S. Pratt, and Messrs. J. H. Gerould, H. L. Jones, C. A. Kofoid, and A. G Mayer.

The department was also fortunate in being able to retain for another year the services of Mr. W. S. Nickerson as Assistant in Zoölogy 2. The number of students in Zoölogy 3 necessitated the employment of an assistant in that course, — Mr. W. A. Lecompte. Each of the students wrote a thesis in connection with and supplementary to the routine dissections of the course on a problem in comparative anatomy.

As usual, Dr. W. McM. Woodworth assisted in the laboratory work in Zoölogy 4 and 5, and gave a portion of the lectures in the former course. The number of students in these courses exceeded the accommodations in room 2, and it was necessary to divide the class for laboratory work into sections, and assign them to different rooms, — an arrangement that entailed considerable inconvenience to students as well as instructors. If the classes continue to be as large, it will be very desirable to provide in the future additional room for their accommodation. Temporary relief from the overcrowded condition of the room for students engaged in research was provided by the Director of the Museum, who allowed Drs. Davenport and Woodworth to fit up one of the rooms used for the storage of collections as a private laboratory, in which a place was also made for one of the advanced students.

Satisfactory progress was made by those engaged in research, and the meetings of the Zoölogical Club every two weeks were well attended. At Commencement the degree of Ph. D. was conferred on one student, now Professor of Zoölogy in the University of California, and that of A. M. on three others.

Considerable time was given, especially by the chairman of the Department and Dr. Woodworth, to the preparation and arrangement of material for the World's Fair Exhibit at Chicago. The zoölogical exhibit contained, besides photographs of the various laboratories, samples of work done by students, and special appliances and apparatus used in the laboratories and lectures. The collection also embraced both wax and plaster models, in various stages of advancement, made from microscopic objects and such apparatus as is employed by advanced students in making them.

During the second half of the year Dr. Davenport gave at the Museum a brief course of lectures on "Morphogenesis," which was open to all members of the University interested in the subject. Similar courses of lectures on other topics would undoubtedly be valuable both to zoölogical students and others interested in the work of the Department.

Since my last report the following contributions from the Zoölogical Laboratory, Nos. XXXIII.-XXXVII., have been published: —

XXXIII. On Urnatella gracilis. By C. B. Davenport. 44 pp., 6 pl. January, 1893.

XXXIV. Note on the Carotids and the Ductus Botalli of the Alligator. By C. B. Davenport. 6 pp., 1 pl. January, 1893.

XXXV. On the Eyes, the Integumentary Sense Papillæ, and the Integument of the San Diego Blind Fish (Typhlogobius californiensis, Steindachner). By W. E. Ritter. 54 pp., 4 pl. April, 1893.

XXXVI. The Development of the Scales of Lepidosteus. By W. S. Nickerson. 26 pp., 4 pl. July, 1893.

XXXVII. Studies in Morphogenesis. I. On the Development of the Cerata in Æolis. By C. B. Davenport. 8 pp., 2 pl. July, 1893.

Since the last report there has also been published "Polychœrus caudatus, nov. gen. et nov. sp.," by Edward Laurens Mark. "Festschrift zum siebenzigsten Geburtstage Rudolf Leuckarts," pp. 298–309. 1 Pl. Leipzig, [Oct.] 1892. Also the translation of Hertwig's "Lehrbuch der Entwicklungsgeschichte," etc., under the title, "Text-book of the Embryology of Man and Mammals."

The first part of Korschelt u. Heider's "Entwicklungsgeschichte der wirbellosen Thiere," by Drs. Mark and Woodworth, is nearly ready for the printer.

By the appointment of an additional Instructor in Zoölogy more time will be allowed for the supervision of research work, and two half-courses are added, one by Dr. Parker on The Nervous System and its Terminal Organs, the other by Dr. Davenport on Experimental Morphology.

The most urgent need of the Department is still the proper equipment of the aquarium and vivarium, there being no adequate provision for keeping even the animals required in the laboratory work of the regular courses; these are often needed at a time when fresh material cannot otherwise be had. But, for the proper development of the department, provision for keeping fresh material to be used in the class-work of undergraduates, is less important than it is to have well arranged compartments in which animals may be subjected to constant and predetermined conditions of environment, the effects of which may be systematically studied. Provision should be made for carrying on investigations of this kind running over long periods of time, as well as for the briefer experimentations which may be carried on by students during the term of a single course. Those engaged in embryological work should also be provided here with every facility for accumulating and keeping under control the material needed in their researches.

The necessities of the Department in this particular, which have long been anticipated by the Curator, so far as regards the space in the Museum building required, cannot much longer remain unsatisfied, unless we are willing to accept an inferior position in the facilities afforded for advanced work in Zoölogy.

REPORT ON OSTEOLOGY.

By Daniel Denison Slade.

SINCE my last report, the osteological collections have received no important additions. They remain in good condition.

In the collection of disarticulated skeletons, many of the orders, notably the Chiroptera, Insectivora, and Rodentia, are deficient in several of the families. This lack of material is a serious drawback, not only to the instructor, but to the scientific student, and it is hoped that it may be supplied in the near future by means now unforeseen.

Specimens from various sources have been received for identification, and have been duly returned after determination.

In accordance with my own previous ideas, and in unison with the suggestions made by the Curator in his last Annual Report, in regard to the original aim of the Museum, to the effect that its highest usefulness may be made available for the purposes of science, and for the more advanced studies, the course of comparative osteology during the last academical year, was devoted more especially to research. This plan, although it does not debar those students who desire to gain merely a general acquaintance with the subject, allows those more advanced to pursue the investigations in which they may be especially interested.

Instead of a final examination, as formerly required, written theses have been adopted, and the results have been very satisfactory. Lectures, as also oral examinations, have been given at the option of the instructor. The important subject of Dentition also received more attention than it has been possible to give to it during the few past years. Four students, three Graduates and one Senior, availed themselves of the opportunities offered by the extensive collections of the University in this department during the last year, — opportunities not to be obtained in any other institution in the country.[1]

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[1] This small number of students, as is the case in other departments, must be attributed to the increased number of elective studies.

Besides a review of Professor Flower's volume on "The Horse," and also other papers, the following have been published by me: —

Osteological Notes, Science, Vol. XXI., No. 523, p. 78; No. 539, p. 301.

Ready for publication in the Museum Bulletin: —

The Significance of the Jugal Arch.

REPORT ON THE MAMMALS AND BIRDS.

By William Brewster.

The collection of mounted Mammals has received the following additions: —

A Bat from Alaska; an Elephant, a Hippopotamus, four Antelopes (*Oryx beisa*, *Nanotragus melanotis*, *Cephalolophus pygmeus*, and *C. Maxwelli*) and a Wild Hog, from Africa; and five Lemurs (including *Lemur catta*, *L. renifrons*, *Propithecus coronatus*, and *Microrhynchus laniger*), from Madagascar. A fine skin of the African Leopard has also been mounted for exhibition in the African Room.

The large and very valuable collection of mounted birds given to the Museum by Mrs. Greene Smith, as described in the last Annual Report, has been prepared for exhibition and arranged in the new cases in the North American Room. After the specimens had been reidentified and relabelled by the assistant and catalogued by Miss Parker, they were transferred from the original moss-covered stands — which proved unsuitable for Museum purposes — to plain white painted stands, uniform with those in general use throughout the Exhibition Rooms. This part of the work and the general renovation of the collection were intrusted to Mr. James T. Clark, a well known professional taxidermist, whose skill in removing dust and grease stains, mending broken parts, and restoring rumpled or defective plumage has enhanced very materially the general beauty of the collection, as well as reduced the number of specimens too imperfect to be retained to but little more than one hundred.

Our old North American collection has been similarly treated, and all the damaged or worthless specimens remounted or thrown out. Those remaining have been arranged with the Greene Smith birds, but the latter are distinguished by their different labels. The combined collection, in accordance with the promise made to Mrs.

Smith, will be hereafter called the "Greene Smith Collection of North American Birds." Taken as a whole, it forms an attractive and very satisfactory representation of the North American bird fauna. Of course there are still gaps to be filled, but most of these concern birds which can be obtained without much difficulty. A pair of Bachman's Warblers, a Snowy Heron, Night Heron, Mallard, Wood Duck, Harlequin Duck, Goosander, and Hooded Merganser have been already bought for this purpose.

The Greene Smith Humming-birds, numbering about three hundred specimens, have been placed on exhibition in the South American room, where an entire case has been devoted to them. This disposition is perhaps open to some criticism on the ground that certain of the species are peculiar to the West Indies, while others breed only in North America. But as by far the greater number are exclusively South or Central American, and as the family is of undoubted Neotropical origin, it seemed best to waive this objection. The only alternative was a place in the Systematic Room or in one of the halls, where the light would have been more or less unsatisfactory. The case in the South American room has a clear, direct light, admirably adapted for bringing out the metallic or iridescent tints which form the chief glory of these exquisite little creatures. Mr. Clark has displayed the specimens to unusual advantage by mounting them on invisible wires fastened to horizontal wooden strips, which extend quite across the case and rise in tiers, each above and a little behind the next, like the seats in a theatre. The flexibility of the wires made it easy to adjust each specimen at precisely the right angle with the rays of light, and the birds, being placed close together and freed from the usual detracting adjuncts of shelves and stands, present an appearance nearly as brilliant and striking as that of a bank of flowers. If the approval of the visiting public may be taken as a criterion, the success of this unconventional treatment can be open to no doubt, for the case of Humming-birds has attracted general and marked attention ever since it was first placed on exhibition. It is perhaps necessary to add that æsthetic considerations were not allowed to interfere with a strict scientific classification, and that small labels bearing the usual inscriptions are pasted on the horizontal strips below the specimens to which they relate.

Five birds sent to the American Museum a year or more ago have been returned by Mr. Allen.

The Assistant in this department has published the following papers and notes in "The Auk": —

Description of a new Humming-bird from Northern Mexico.

A Brood of Young Flickers (*Colaptes auratus*) and how they were fed.

On the Occurrence of certain Birds in British Columbia.

The Ipswich Sparrow (*Ammodramus princeps*) on the Coast of Georgia.

REPORT ON THE REPTILES AND FISHES.

By Samuel Garman.

The work in these departments has included fitting up exhibits for the Pacific and the Asiatic rooms, and rearrangement of the North American and the Australian specimens, beside the usual routine work, identifications, and studies. Better representatives have replaced a considerable number of those formerly on the shelves, and many duplicates have been entirely withdrawn from the collections. Several tortoises and a large alligator were mounted for the North American room. Among the outgoing material was that furnished students in the laboratories, and a couple of series of Reptiles and Batrachians sent to Dr. Hurter.

Donations were received from Mr. Philipp Adams, Dr. Harrison Allen, A. N. Cheney, Esq., Mr. Chick, William Clapp, Hon. J. G. A. Creighton, Prof. W. Faxon, J. B. Greenough, Esq., Mr. Thomas A. Hillery, Dr. L. C. Jones, W. H. Jones, Esq., Mrs. J. M. Maynard, Colonel McDonald, U. S. Fish Commissioner, Gerrit S. Miller, Esq., Mr. Wm. B. Richardson, Mr. W. W. Rockwell, Robt. Gaston Smith, Esq., Mr. Rollo W. Snell, Miss Elizabeth Taylor, Bradford Torrey, Esq., and Mr. N. Vickary. Many of the accessions are of rare and desirable species. Especially valuable are the live specimens sent by Dr. Hurter; kept living for a time, they afforded the means of determining much relating to the life histories of their species.

A particular study of the Acipenseroids was made by Mr. Nicolas Borodine, sent out by the Russian government.

The amount of loss from evaporation, leakage, or breakage is very small.

The list of publications is made up of the following, in addition to unsigned reviews and other articles.

In "Science": —

"On Chelydra serpentina."

"On the Growth of the Rattle of Crotalidæ."

"The Lac de Marbre Trout." (Reprinted by Forest and Stream, and others.)

In the Proceedings of the Massachusetts Historical Society: —

"On Cabinet, Library, and Wardrobe Pests," in "The Ravages of Bookworms," by the Librarian of the Society, Dr. S. A. Green. (Also in Science.)

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

By Samuel Henshaw.

Additions to the collection of the department have been received from Messrs. A. Agassiz, M. A. Barber, F. Blanchard, P. P. Calvert, D. W. Coquillett, J. W. Freese, H. H. Lyman, C. J. Maynard, G. S. Miller, Jr., A. P. Morse, S. H. Scudder, J. G. Shute, Roland Thaxter, William Trelease, and the Peabody Academy of Science, Salem.

Various portions of the collection have been studied at the Museum by Messrs. F. Blanchard, T. L. Casey, H. G. Dyar, E. P. Felt, C. H. Fernald, Roland Hayward, G. H. Horn, J. G. Jack, A. P. Morse, F. W. Russell, S. H. Scudder, and Roland Thaxter; assistance has also been given to Messrs. P. P. Calvert, D. W. Coquillett, H. H. Lyman, and Roland Thaxter.

The entire collection has been examined three times, and though not entirely free from pests, is, as a whole, in excellent condition.

The withdrawal of duplicates and the condensation of scattered material has relieved the department of various odd boxes and cabinets; the Loew collection of Diptera and a part of the Odonata are the only portions of the collection not in the regular Museum boxes and cabinets.

A rearrangement of the cabinets, rendered desirable by the increased space afforded by the additional room, has been effected; the systematic and biological collections of Lepidoptera and Coleoptera are in one room, the other orders are in a second room, while the third room is reserved for the library and laboratory.

The routine work has been chiefly to facilitate the work of specialists wishing to study the collection; for this purpose portions of the Odonata, Orthoptera, Hemiptera, Coleoptera, and Lepidoptera Rhopalocera have been rearranged.

Additional space having been granted in the North American room, three boxes, two of Odonata and one of Hemiptera, are ready to be placed on exhibition.

The library has been rearranged; a considerable number of books have been transferred to the Museum library.

REPORT ON THE INVERTEBRATA (EXCLUSIVE OF INSECTS).

By Walter Faxon.

A good deal of time has been spent during the past year in rearranging and extending the exhibition collections of Invertebrata. A change of plan was decided upon early in the year, by which the marine forms were to be eliminated from the rooms assigned to illustration of the Continental Faunæ. Space was thereby gained for a fuller display of land and fresh-water types, and much unnecessary duplication of species exhibited in the rooms devoted to the Oceanic Faunæ was avoided. This radical change of plan involved a complete overhauling of the Invertebrata in the North American, South American, and Europæo-Siberian Rooms. An entirely new series of land and fresh-water shells has been selected, mounted, and placed on exhibition in the African, Australian, and Indian Faunal Rooms; another collection of terrestrial shells from the Polynesian Islands has been placed in one of the cases in the Pacific Ocean Room. The preparation of these collections for exhibition was intrusted to Misses Clark and Parker. The Pacific Ocean faunal collection, though far from completed, was brought up to a condition such as to warrant opening the room to the public last winter.

Material for study has been sent from the Museum to F. E. Schulze, Berlin, C. Pictet, Geneva, F. Meinert, Copenhagen, G. W. Müller, Naples, and R. P. Bigelow, Baltimore. A collection of corals has been given to the Bigelow School, Marlborough, Mass. Gifts of specimens have been received from the California Academy of Sciences, the Boston Society of Natural History, the U. S. National Museum, A. Agassiz, Cambridge, Ign. Bohrar, Madrid, G. S. Miller, Jr., Cambridge, and C. J. Maynard, Boston.

An elaborate final Report on the Museum collection of Paguridæ dredged by the "Blake" Expeditions of 1877–80 has been prepared by Professor Alphonse Milne-Edwards and Mr. E. L. Bouvier, and published in the Memoirs of the Museum, Vol. XIV., 172 pages, 12 plates. My own Report on the Crustacea secured during the cruise of the U. S. Fish Commission steamer "Albatross" off the tropical Pacific Coast and in the Gulf of California, during 1891, was finished last winter. On account of the length of time required to prepare the plates which are to accompany this Report, preliminary descriptions of the new genera and species have been printed in the Museum Bulletin, Vol. XXIV., pp. 147–220.

REPORT ON THE PALÆONTOLOGICAL DEPARTMENT.

By Alpheus Hyatt.

In connection with work on the Carboniferous Cephalopods of Texas, which will be shortly published, the Assistant has classified and renamed the corresponding collection in the Museum, and made a number of preparations showing the stages of growth of different species and genera.

The Whitney Collection of California fossils presented to the Museum this year has been looked over and in part studied. It is small, but it contains some fossils of extraordinary interest. Among those that may be mentioned are a number of the types of Gabb's descriptions of California fossils. The value of these originals, especially with reference to the history of Mesozoic Geology of the West cannot bc overestimated.

Through Professor Pickering the Museum has also received a small collection of South American fossils collected by Mr. A. E. Douglass.

The department is indebted to Dr. R. T. Jackson for work upon the collections, and the superintendence of the work of Miss Clarke in mending broken fossils of the Gebhard and other collections.

The following papers have been published: —

Bioplastology and the related Branches of Scientific Research, by Alpheus Hyatt, Proc. Bost. Soc. Nat. Hist., XXVI., 1893, pp. 59–125.

The Terms of Bioplastology, by Alpheus Hyatt, Zool. Anzeiger, Nos. 426, 427, 1833.

Bemerkungen zu Schulze's System einer deskriptiren Terminologie, Biol. Centralbl., XIII., Nos. 15, 16, 1893.

REPORT ON THE LIBRARY.

By Miss F. M. Slack.

During the year ending September 1, 1893, the Library has received 633 volumes, of which 5 are atlases, 1,830 parts, and 107 pamphlets: —

	VOLUMES.	PARTS.	PAMPHLETS.
Gift	8	113	11
Exchange	138	675	48
Purchase	33	224	1
A. Agassiz	136	785	40
Binding Parts	316		
Whitney Library	2	33	7
	633	1830	107

The number of volumes now in the Library (exclusive of pamphlets and the Whitney Library) is 21,024. There are 14,417 pamphlets bound in 2,452 volumes, making the total number of volumes 23,476.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE ACADEMIC YEAR 1892–93.

Of the Bulletin: —

Vol. XVI. [Geological Series Vol. II.].

No. 11. The Conditions of Erosion beneath Deep Glaciers based upon a Study of the Boulder Train from Iron Hill, Cumberland, R. I. By N. S. Shaler. pp. 42. Map and 4 Plates. January, 1893.

No. 12. Acmite Trachyte from the Crazy Mountains, Montana. By J. E. Wolff and R. S. Tarr. pp. 10. April, 1893.

No. 13. Report on the Dredging Operations off the West Coast of Central America to the Galapagos, etc. V. Report upon Rocks collected from the Galapagos Islands. By G. P. Merrill. pp. 4. July, 1893.

No. 14. A Basic Dike in the Connecticut Triassic. By L. S. Griswold. pp. 4 and 1 Plate. August, 1893.

[Vol. XVI. *to be continued.*]

Vol. XXIII. [Complete.]

No. 4. Studies from the Newport Marine Laboratory. — XXIX. Preliminary Note on some Modifications of the Chromatophores of Fishes and Crustaceans. By A. Agassiz. pp. 6. 1 Plate. December, 1892.

No. 5. Reports on the Dredging Operations off the West Coast of Central America to the Galapagos, etc., by the U. S. Fish Commission Steamer "Albatross." III. On a Peculiar Type of Arenaceous Foraminifer from the American Tropical Pacific, Neusina Agassizi. By A. Goës. pp. 4. 1 Plate. December, 1892.

No. 6. Report on the Results of Dredging by the U. S. Coast Survey Steamer "Blake." XXXIV. Report on the Mollusca dredged by the "Blake" in 1880, including Descriptions of several New Species. By Katharine J. Bush. pp. 43. 2 Plates. January, 1893.

Vol. XXIV. [Complete.]

No. 1. Contributions from the Zoölogical Laboratory. — XXXIII. On Urnatella Gracilis. By C. B. Davenport. pp. 44. 6 Plates. January, 1893.

No. 2. Contributions from the Zoölogical Laboratory. — XXXIV. Note on the Carotids and the Ductus Botalli of the Alligator. By C. B. Davenport. pp. 4. 1 Plate. January, 1893.

No. 3. Contributions from the Zoölogical Laboratory. — XXXV. On the EYES, the Integumentary SENSE PAPILLÆ, and the INTEGUMENT of the San Diego Blind Fish (TYPHLOGOBIUS CALIFORNIENSIS, STEINDACHNER) By W. E. RITTER. pp. 54. 4 Plates. April, 1893.

No. 4. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer. "ALBATROSS." IV. Vorläufiger Bericht über die erbeuteten HOLOTHURIEN. Von H. LUDWIG. pp. 10. June, 1893.

No. 5. Contributions from the Zoölogical Laboratory. — XXXVI. The DEVELOPMENT of the SCALES of LEPIDOSTEUS. By W. S. NICKERSON. pp. 27. 4 Plates. July, 1893.

No. 6. Contributions from the Zoölogical Laboratory. — XXXVII. STUDIES in MORPHOGENESIS. I. On the DEVELOPMENT of the CERATA in ÆOLIS. By C. B. DAVENPORT. pp. 8. 2 Plates. July, 1893.

No. 7. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "ALBATROSS." VI. Preliminary Descriptions of NEW SPECIES of CRUSTACEA. By W. FAXON. pp. 72. August, 1893.

Of the Memoirs: —

Vol. XIV. [Complete.]

No. 3. Reports on the RESULTS OF DREDGING by the United States Coast Survey Steamer "BLAKE." XXXIII. Descriptions des CRUSTACÉS de la Famille des PAGURIENS recueillis pendant l'Expédition. Par A. MILNE-EDWARDS et E. L. BOUVIER. pp. 172. 12 Plates. April, 1893.

[B]

THE Faculty of the Museum of Comparative Zoölogy will receive applications from candidates desiring to occupy the table at the Naples Zoölogical Station, which has been placed at its disposal from October 1, 1893.

The applicant must be (or have been recently) a student or instructor at some American University, preferably a person who has taken the degree of Ph. D. or S. D.; he must have published some creditable original investigation, and should be recommemded as an able investigator by the professor under whom he has studied.

Applicants will please forward to the undersigned their recommendations, and a statement of their qualifications, and of the subject to which they hope to devote themselves.

In order that the Faculty may make the most satisfactory disposition of the table during the whole year, the applicants are requested to state the length of time they desire to remain at Naples, and also the earliest and latest dates within which they can avail themselves of the appointment.

The Faculty will, at suitable intervals, nominate to the Corporation of Harvard College for approval the incumbent or incumbents for the year 1893–94.

ALEXANDER AGASSIZ,
Director.

[C]

INVESTED FUNDS OF THE MUSEUM.

In the hands of the Treasurer of Harvard College, Sept. 1, 1893.

Sturgis-Hooper Fund	$100,000.00
Gray Fund	50,000.00
Agassiz Memorial Fund	297,933.10
Teachers and Pupils Fund	7,594.01
Permanent Fund	117,469.34
Humboldt Fund	7,740.66
Virginia Barret Gibbs Fund	5,000.00
	$585,737.11

The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Curator. The accounts are annually examined by a committee of the Museum Faculty. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts with vouchers to the payment of which the income is applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Humboldt Fund (about $400) can be applied for the benefit of one or more students of Natural History, either at the Museum, the Newport Marine Laboratory, the United States Fish Commission Station at Wood's Holl, or elsewhere.

Applications for the tables reserved for advanced Students at the Newport Marine Laboratory, and for the tables at the Wood's Holl Station, should be made to the Curator of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

The income of the Virginia Barret Gibbs Scholarship Fund, of the value of $250, is assigned annually, with the approval of the Faculty of the Museum, at the recommendation of the Professors of Zoölogy and of Comparative Anatomy in Harvard University, "in supporting or assisting to support one or more students who have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy."

See Appendix B of this Report for the conditions upon which the table at the Naples Zoölogical Station is assigned.

With the Compliments of
ALEXANDER AGASSIZ.

MUS.120.206.1

ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE,

FOR

1894–95.

CAMBRIDGE, U. S. A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1895.

Case .... Shelf ....

LIBRARY

OF THE

Peabody Museum of American Archæology and Ethnology

IN CONNECTION WITH HARVARD UNIVERSITY.

PRESENTED BY

A. Agassiz.

Received Jan. 1896.

ANNUAL REPORT

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Mus. 120.20.6.1

gift of
A. Agassiz
Rec. January 1896

FACULTY OF THE MUSEUM.

Faculty.

CHARLES W. ELIOT, *President.*
ALEXANDER AGASSIZ, *Curator.*
GEORGE L. GOODALE.
JOSIAH D. WHITNEY, *Secretary.*
HENRY P. WALCOTT.

Officers.

ALEXANDER AGASSIZ	*Director and Curator.*
JOSIAH D. WHITNEY	*Sturgis-Hooper Professor of Geology.*
NATHANIEL S. SHALER	*Professor of Geology.*
E. L. MARK	*Hersey Professor of Anatomy.*
WILLIAM MORRIS DAVIS	*Professor of Physical Geography.*
J. ELIOT WOLFF	*Professor of Petrography and Mineralogy.*
H. L. SMYTH	*Assistant Professor of Mining.*

APPOINTED BY THE FACULTY OF THE MUSEUM.

WALTER FAXON	*Assistant in Charge.*
D. D. SLADE	*Assistant in Osteology.*
SAMUEL GARMAN	*Assistant in Herpetology and Ichthyology.*
WILLIAM BREWSTER	*Assistant in Ornithology and Mammalogy.*
ALPHEUS HYATT	*Assistant in Palæontology.*
SAMUEL HENSHAW	*Assistant in Entomology.*
W. McM. WOODWORTH	*Assistant in Charge of Vermes.*
ALFRED G. MAYER	*Assistant in Charge of Radiates.*
C. R. EASTMAN	*Assistant in Vertebrate Palæontology.*
MISS F. M. SLACK	*Librarian.*
MAGNUS WESTERGREN	*Artist.*

APPOINTED BY THE PRESIDENT AND FELLOWS.

ROBERT TRACY JACKSON	*Instructor in Palæontology.*
J. B. WOODWORTH	*Instructor in Geology.*
G. H. PARKER	*Instructor in Zoölogy.*
W. McM. WOODWORTH	*Instructor in Microscopic Anatomy.*
C. B. DAVENPORT	*Instructor in Zoölogy.*
HENRY R. LINVILLE	*Assistant in the Zoölogical Laboratories.*
H. S. JENNINGS	*Assistant in the Zoölogical Laboratories.*
JOHN T. HAMAKER	*Assistant in the Zoölogical Laboratories.*
H. V. NEAL	*Assistant in the Zoölogical Laboratories.*
ROBERT DeCOURCEY WARD	*Instructor in Meteorology.*
LEON S. GRISWOLD	*Assistant in Physical Geography.*
R. A. DALY	*Instructor in Geology.*
C. L. WHITTLE	*Assistant in the Petrographical Laboratory.*
F. C. SCHRADER	*Assistant in the Geological Laboratory.*

REPORT.

To the President and Fellows of Harvard College: —

During the past year the usual courses of instruction have been given at the Museum in the Natural History Laboratories. Those in Zoölogy were given by Professor Mark, Dr. Slade, Dr. Davenport, and Dr. Parker, assisted in the Laboratory work by Messrs. H. V. Neal, H. S. Jennings, W. B. Cannon, and S. K. Fenollosa. Dr. W. McM. Woodworth has, as in previous years, taken charge of the Laboratory work, and has given some lectures in the course on Microscopical Anatomy.

Professors Whitney, Shaler, Davis, and Wolff gave courses of instruction in Geology, Palæontology, Physical Geography, Meteorology, and Petrography. The Assistants in these departments were Messrs. Robert T. Jackson, J. B. Woodworth, R. E. Dodge, L. S. Griswold, R. DeC. Ward, and C. L. Whittle. The courses in Mining Geology and allied subjects were given by Mr. H. L. Smyth. The valuable Library of Professor Pumpelly, which he deposited in the Library of the Mineralogical Section, has been accessible to the students of the Geological Department.

For the details of these courses of instruction, as well as of the summer courses in Geology, I would refer to the accompanying special reports of the Professors and Instructors.

The Newport Marine Laboratory has, as usual, been open to advanced students in Zoölogy. Thirteen students spent a part of their time in the Laboratory collecting material for their special investigations, which they will continue and prepare for publication at the Museum. It is unfortunate that there is not in constant attendance at the Laboratory some one thoroughly familiar with the marine fauna of our coast, who could devote more time to the interests of the students than I am able to give.

Dr. W. McM. Woodworth continued his photographic experiments with great success during the past summer. Our apparatus has been modified and greatly improved. A great part of the time was occupied in taking photographs of some of the larger pelagic animals.

We have to thank the late Colonel Marshall McDonald, United States Fish Commissioner, for the facilities granted to our students in connection with their work at the Fish Commission Station at Wood's Hole.

The income of the Virginia Barret Gibbs Scholarship was used according to the terms of the gift.

The Faculty of the Museum nominated as occupants of the Naples Table for parts of the year 1894–95 Professor W. E. Ritter, of the University of California, Professor Reighard, of the University of Michigan, and Professor C. E. Nutting, of the State University of Iowa.

It may be useful to lay before the Corporation my observations on some of the Marine Biological Laboratories, as they may assist in shaping the course of the University, when the time comes, either in favor of establishing a station entirely under the control of Harvard University, or in connection with the United States Fish Commission, or in favor of uniting with other Universities in maintaining a station on the principles which control the Classical Schools at Athens and Rome.

During the past winter I visited the zoölogical stations at Naples, Trieste, Ville Franche, Marseilles, Banyuls sur Mer, and Plymouth. With the exception of the stations at Naples and at Plymouth, they are connected with educational institutions, holding to them much the same relations which a chemical, physical, or other laboratory holds. These stations are either managed by a member of the natural history staff, or under the control of a Professor from the institution with which they are connected. The investigations carried on at these stations are usually published in the serials issued by the natural history departments of their respective universities. The teaching staff avail themselves of the facilities offered by the stations to obtain fresh material throughout the year for the use of students during term time.

The organization at Plymouth is different. It depends for its support upon a large number of persons who are interested in the promotion of marine investigations. It is in charge of a Director, and is managed by a Board of Trustees. The station publishes a Bulletin giving an account of the work accomplished there.

The organization at Naples is still different. Dr. Dohrn, the enthusiastic founder and Director of the Station, receives the support of a number of European governments, who pay an annual subsidy for the use of tables at the rate of £100 a year; and in addition he receives a grant from the German government. This enables him to keep a permanent staff of skilled assistants, who carry on a zoölogical observatory. Their investigations are published in Monographs and Bulletins, the cost of which is defrayed in part from their sale, in part from the fees and subsidies paid for the occupation of the thirty-five tables available at Naples, and in part by the Director. The special work of the occupants of the tables is also frequently published at the cost of the station.

A fine aquarium is maintained at Naples, to which a small entrance fee is charged. At Marseilles, Plymouth, and Banyuls smaller aquaria are also open to the public. At Banyuls and at Naples small steam vessels are owned by the stations, and are employed in collecting material and in making dredging expeditions at moderate depths. At the other stations steamers and boats are hired when needed.

It is evident that the status of these two types of stations is very different. In the one, the work of the University Biological Laboratories may be said to continue under the same influences as at the University. In the other, governments and universities combine to support and foster more extended investigations in natural history than a single institution can be expected to maintain. How far it is the province of a university to assist in carrying on, outside of its own gates, the investigations of others than its students, is a financial question which need not be discussed. While it is eminently proper for governments to promote the interests of such a station as Naples, it remains to be seen how long it will be possible to interest various universities in any institution in the management of which they have no influence.

The stations at Banyuls and at Roscoff owe their origin and principal support to Professor H. de Lacaze-Duthiers. The stations receive but a small subvention from the Sorbonne, the equipment and the greater part of the running expenses being provided by Professor Lacaze-Duthiers and his friends. Instruction is carried on at both his Marine Laboratories as it would be at the Sorbonne, and he is assisted during a great part of the year by a large staff of temporary Professors from every part of France. The results of the investigations carried on under his supervision are published in the "Archives de Zoologie Expérimentale," also founded by Lacaze-Duthiers.

There is only a nominal fee to be paid for admission to these Laboratories, which attract students from all parts of the world. Similarly at Trieste, Ville Franche, and Marseilles, students are practically admitted free of cost from Austrian, Russian, and French Universities. Foreigners can readily gain admittance to these Laboratories on the most liberal terms. The Marseilles Station at Endoume has the immense advantage of being within a short distance of the University, and is in fact one of its biological laboratories. The work done at Trieste is published, under the auspices of Professor Claus, in the "Arbeiten aus dem zoologischen Institute der Univ. Wien," and a special appropriation is made by the city of Marseilles for the publication of the Annals of the Laboratory.

The cost of maintaining three or four students at the Naples Station is a serious expenditure for any university, and out of proportion to the expenses incurred for them in other departments, that cost being represented by many things in which a distant educational institution can only have an indirect interest. The cost of a table at Plymouth and in this country at Wood's Hole is very much less than at Naples.

In as far as Harvard University is concerned the annual expenditures of the Newport Marine Laboratory, including those of the steam launch and the transportation of the students to and from Newport, if distributed among the tables in use by the students, by myself and assistants, amount to somewhat less than the expense for the same number of tables at the Wood's Hole Marine Biological Laboratory for similar facilities. The results of the work done at the Newport Marine Laboratory have thus far been published in the Bulletins of the Museum.

It is true that the expense of an independent station for each prominent University would in this country be very large, and that an American Marine Biological Laboratory supported by the joint contributions of the principal Universities would be in the line of economy. But as soon as a single institution of that sort increased in size and attempted to grant facilities for more or less elementary instruction as well as for advanced work, it would become a cumbrous machine difficult of management. Duplication in all directions would soon become necessary, and the advantages of a compact and easily controlled laboratory would be lost.

Were it possible for each University to use its resources in connection with the facilities for advanced work available at the Laboratory of the Fish Commission at Wood's Hole, a maximum amount of original work might be expected. For no University laboratory can hope to obtain the facilities accruing from the maintenance of the fleet of small boats, steamers, and personnel which forms a necessary part of the equipment of the Fish Commission Station. Such an alliance, however, can only be formed provided an equitable agreement, and one satisfactory to the Fish Commission, could be made. This would enable the Universities to foster original work only, and not to expend, as they do now, their resources or the time of their instructors in elementary work.

The mere collecting of material for ordinary investigation at a marine station is not expensive, but it is expensive to carry on the continuous observations of eminent specialists, and subsequently to publish their investigations. Such observations could well be carried on in connection with the work of a Government Fish Commission, and are not only germane to its investigations, but all-important to their success. Still more expensive is it to settle the many problems in thalassography which have arisen in consequence of the more recent deep-sea explorations, — problems which require for their solution the use of steamers thoroughly equipped for their task. This can be most successfully accomplished either by special explorations, or more naturally in the course of time in connection with the problems of a Fish Commission.

The number of visitors to the Museum Exhibition Rooms continues to increase, the attendance on Sundays specially having become most gratifying. This marked increase is no doubt owing in part to the opening of the Botanical and Mineralogical Museums, and in part to the fact that the Museum is open daily nearly the whole day, and not merely at specified times during the week. It would greatly add to the usefulness of the collection to the public, were the Museum able to appoint guides who would at certain times pass through the exhibition rooms and explain the more interesting features of the collection to a limited number of visitors. This is accomplished to a certain extent for school children who visit the Museum with their teachers.

We are greatly indebted to Professor Hyatt for the care he has given to the collection of Invertebrate Fossils under his charge; he has spent considerable time in picking out additional Cephalopods, which have been placed on exhibition with the Systematic Collection of Mollusks. Mr. R. T. Jackson has also taken great interest in this collection, and we owe to him the acquisition of many interesting fossils filling gaps in our stores, as well as thanks for the time he has spent in arranging certain parts of the collection of Fossil Invertebrates.

Mr. Brewster has, as in former years, kindly supervised the care of the collection of Birds and Mammals.

To Mr. Faxon has fallen the general supervision of the Museum collections, and much of the routine work of the establishment. During the past year he has been mainly engaged in the revision of the collection of Mollusks, and in the printing of his Monograph on the Crustacea of the "Albatross" Expedition of 1891.

Mr. Garman reports that the alcoholic collections of Reptiles and Fishes are in unusually good condition, and the same is the case with the alcoholic collections of Invertebrates.

Mr. Henshaw also states that the Entomological Collections are in excellent condition, and that their use and that of the Entomological Library is constantly increasing.

Since last January, Dr. C. R. Eastman has been placed in charge of our collection of Fossil Vertebrates. Since the death of Dr. G. A. Maack, in 1871, it had received no attention. The immense accessions made since that time by purchase or by expeditions were merely unpacked and laid away in trays, often in the original wrappers. With the exception of the examination of some of the mammalian remains by Professors Scott and Osborne, nothing of value had been done. Dr. Eastman has now made a general revision of this collection, arranging the material systematically. We can therefore form some idea of what our desiderata are to make the collection, what it should be, a representative one both faunally and systematically. A great mass of valuable material will soon be available for exhibition, and we hope to lay aside for the Fossil Faunal Rooms such types as properly belong on exhibition. To give an idea of our Fossil Vertebrate collection, Dr. Eastman has prepared a chronological list of the collections which have at various times become the property of the Museum.

Dr. W. McM. Wordworth, who has had charge of the collection of Worms during the greater part of the past year, has prepared a number of exquisitely mounted specimens, which have been placed in the Exhibition Rooms. He has devoted considerable time to making these preparations, and to obtaining additional material for the same purpose.

All attempts at placing any collections either in the Geographical or Geological Exhibition Rooms have been given up. One of the rooms is now occupied by the Ornithological Department, and in the other, which leads to the Botanical Exhibition Rooms, we expect to place such collections as will interest both the zoölogist and botanist.

It is hoped that the Geological and Geographical Exhibition Rooms will eventually be arranged in the southwest corner-piece, which is to adjoin the Mineralogical Collections, whenever the time comes, as it soon must, when the Geological and Geographical Departments will find their quarters in that section of the University Museum.

Mr. W. E. D. Scott succeeded, during the past year, in interesting a number of gentlemen in his plans for placing on exhibition a selected series of Birds, artistically mounted and isolated, so that each small case should illustrate some point of interest in ornithology. The sum of $1,690 has been expended on this exhibit. A list of the gentlemen who have pecuniarily assisted Mr. Scott is given in Appendix D.

One of the Exhibition Rooms connecting the Zoölogical with the Botanical Department was assigned to Mr. Scott, and a short time before Commencement the room was opened to the public. It contained about fifty cases of exquisitely mounted birds, which cannot fail greatly to interest the public, and will add immensely to the value of our ornithological collection. The birds all formed part of Mr. Scott's collection of North American Birds, which he has presented to the Museum. In addition to these, Mr. Scott has also assigned to the Museum his collection of West Indian Birds. The whole consists of over 3,000 specimens, 1,500 North American and 1,600 West Indian Birds, and is an invaluable addition to the Ornithological Department of the Museum. (See Appendix E.) It is to be hoped that the exhibition of this unique collection will interest the friends of ornithology, and lead to some sufficient provision for the full development of Mr. Scott's plan. This embraces a local New England collection, a North American collection, a Western Hemisphere collection, and ultimately a fairly representative general collection, each of which Mr. Scott hopes to illustrate, according to the plan pursued in the collection now on exhibition.

The Library has received either in exchange or by gift and purchase the usual number of accessions. The number of volumes is now nearly twenty-five thousand.

A list of the publications of the Officers and Instructors of the Museum, other than those contained in our Memoirs and Bulletins, will be found accompanying the special reports.

For a complete List of the Publications of the Museum during the past year I refer to Appendix A. The amount of our publications has been exceptionally large, owing to the number of Reports of the "Albatross" Expedition of 1891, as well as the Reports on my expeditions to the Bermudas and Bahamas and Cuba on the "Wild Duck," forming Volume XXVI. of the Bulletin (282 pp. and 77 Plates). Connected with the latter we have published as the last number of Volume XVI. of the Bulletin, which had remained uncompleted for many years, a Report by Professor R. T. Hill of the United States Geological Survey on his exploration of the island of Cuba. We have also issued the first number of the third volume of the Geological Series, Vol. XXVIII. No. 1. The principal Reports relating to the "Albatross" are the Memoir on the Holothurians by Professor H. Ludwig of Bonn, containing a number of colored figures of abyssal Holothuroidea (183 pp. and 19 Plates), and the Memoir on the Crustacea by Mr. Faxon, with ten colored Plates of deep-sea types (Vol. XVII. pp. 292, 67 Plates and 1 Chart). In the Bulletin have appeared the Reports of Dr. Ortman on the Schizopods, of Dr. Bergh on the Opisthobranchs, of Dr. Giesbrecht on the Copepods, of Dr. Hartlaub on the Comatulæ, and of Mr. Townsend on the Birds of Cocos Island and Malpelo, and by Dr. Dall and Mr. A. G. Mayer on some of the collections made by the "Wild Duck."

The Corporation made the Zoölogical Department a grant of $400 to aid in the publication of some of the contributions from the Zoölogical Laboratory, which either have appeared in Volume XXVII. of the Bulletin, or are in the hands of the printer.

The Memoir by Mr. Garman on the Cyprinodonts (180 pp. and 12 Plates), mentioned in the last Report, has also been published.

These different publications comprise one volume and eleven numbers of the Bulletin, and one volume and two numbers of the Memoirs.

The Plates for Professors Milne-Edwards and Bouvier's Memoir on the Galathoidæ have been completed, and, as soon as they have been revised by the authors their Monograph can be sent to the printer.

The Plates to accompany Dr. Goës's memoir on the Foraminifera of the "Albatross" Expedition of 1891 are in his hands for revision, and the text has been sent to the printer. Dr. Müller's Report on the Ostracods is in the hands of the binder.

Excellent progress is making with the Monograph of Messrs. Wachsmuth and Springer on the Crinoidea Camerata of North America. Over 300 pages have been cast, and 50 Plates have been printed.

Mr. Garman is making good progress with his memoir on the Deep-Sea Fishes of the "Albatross" Expedition of 1891. About 20 Plates have been finished. I have myself prepared the greater part of my Report on the Echini of the same Expedition. It will be illustrated by at least 25 Plates, which will be taken in hand by Mr. Westergren as soon as the Plates for the Fishes are out of his hands. Dr. Mark reports that he has made fair progress with his Monograph of the remarkable deep-water Cerianthoid procured by the "Albatross."

I have also received the manuscript of the Report of Dr. Otto Maas on the Acalephs of the "Albatross" Expedition of 1891, to be accompanied by 15 Plates which are now in the hands of Messrs. Werner and Winter.

Professor Goode writes me that the Report on the Deep-Sea Fishes of the Western Atlantic by himself and Dr. Bean, which contains the "Blake" collection of Fishes, is in the hands of the printer.

In connection with my investigations on the Coral Reefs of the West Indies, and of the "Albatross" Expedition of 1891, Professor R. T. Hill of the United States Geological Survey has with the consent of the Director, made an extended exploration of the Isthmus of Panama, with a view of determining as far as is practicable the period at which the Isthmus of Panama was elevated, and when the connection which once existed between the Gulf of Panama and the Caribbean Sea ceased to exist. He was greatly assisted in this exploration from the interest taken in the subject by Colonel Rives, the Superintendent of the Panama Railroad, to whom, as well as to the President of the road, we are greatly indebted for various favors connected with his expedition. Professor Hill made an extensive collection of rocks and of fossils, and is now preparing a preliminary report on the results.

During the past winter I spent a couple of weeks along the Florida Keys on a sea-going tug to re-examine them in the light of the experience I had gained in the study of the Bahama and Cuban reefs and of the Bermudas. A preliminary note on the results was published in the "American Journal of Science" from a letter written to the late Professor J. D. Dana. I was fortunate enough to obtain, thanks to the kind offices of Mr. Peter A. Williams of Key West, samples taken at every 25 feet of the core of an Artesian well driven on Key West Island from the surface to a depth of 2,000 feet. These samples have been placed for examination in the hands of Mr. E. O. Hovey and Mr. George H. Eldridge, of the U. S. Geological Survey, and I hope to add to my own report of this last exploration of the Florida Keys the results obtained by Messrs. Hovey and Eldridge. The Director of the U. S. Geological Survey has kindly consented to have an analysis made of the samples obtained, and Mr. Eldridge hopes to make a comparison of the core of the Key West well with those of Lake Worth, St. Augustine, and Tallahassee. It is thought that this examination may give us accurate results regarding the thickness of the Florida Reef, and the nature and age of the rocks upon which it rests.

In connection with the various expeditions undertaken by the Museum, I have to thank Commander C. D. Sigsbee, U. S. Hydrographer, and Colonel Duffield, the Superintendent of the U. S. Coast Survey, for assistance and suggestions.

Among the collections received I may mention that of the Deep-Sea Fishes made by the "Blake," which had been in the hands of Professor Goode and Dr. Bean while they were preparing their Memoir on the Deep-Sea Fish Fauna of the Western Atlantic, now in press. Dr. Goës has also sent back the Foraminifera of the "Albatross" Expedition of 1891, and the material from the Caribbean Sea belonging to the Coast Survey and to the Fish Commission, which had been sent him for comparison, has been returned to the Smithsonian (with a named collection of types) and to the Coast Survey.

We have received from the Smithsonian a series of types of Deep-Sea Fishes collected at various times by the "Albatross"; a collection of Fresh-water Fishes from Tennessee, Kentucky, and Texas; also a collection of Sponges from Alaska, collected by Dr. Dall, and identified by Mr. Lawrence M. Lambe of the Canadian Geological Survey. The National Museum has sent us a set of the more interesting deep-sea types from the collection of Holothurians returned by Dr. Ludwig.

We have as usual filled a few gaps in our collections by purchases from Prof. H. A. Ward and from Rowland Ward & Co. A small collection of Pteropods has been obtained from Mr. Sowerby.

Thanks to the kindness of the authorities of the British Museum, we have been able to secure a large collection of casts representing types the originals of which we can hardly hope to obtain. A part of this collection has been received, and we are indebted to Dr. H. Woodward for supervising that invoice.

Messrs. Scott and Osborne have returned the Fossil Mammals which had been lent to them.

The cast of Iguanodon obtained from the Brussels Museum has been successfully mounted, and forms the centre-piece of the Jurassic Exhibition Room.

From the Oxford Museum we have received in exchange some casts through Professor Lankester.

From Mr. Alan Owston we have received a few Japanese desiderata; from Mr. Russell Johnson of Buffalo some specimens of Eurypterus; from Dr. Beecher some interesting preparations of Trilobites; from Mr. Appleton Sturgis a most interesting Sponge from New Guinea; and from Mr. F. W. Townsend a valuable alcoholic collection of Invertebrates from the Persian Gulf.

As will be seen from the special reports, considerable material has been sent to different investigators, either for study or in exchange, and I may mention the National Museum, the British Museum, and the Jardin des Plantes as having received from us collections to fill some of their desiderata.

The alcoholic specimen of Pleurotomaria collected by the "Hassler" has been sent to Professor E. Bouvier of the Jardin des Plantes for investigation.

As usual, the facilities offered by the Museum Library and its collections have been available to properly qualified persons under suitable restrictions. These often seem petty to the applicants, but are the results of our experience as necessary for the safekeeping of the books and of the collections.

I beg to call the attention of the Corporation to the precarious situation of the Museum. We have been most fortunate during the past twenty years in enlisting the support of Assistants who have served the Museum for small salaries, or who have given their services, from the interest they felt in its development, and on account of the facilities for investigation afforded to them. It is evident that, however satisfactory this may be to us at present, we can hardly hope to depend upon this state of things as upon a permanent organization.

The time will come when the Curator must receive an adequate compensation, and whenever we are obliged to pay our comparatively small staff for their whole time such salaries as are paid at other institutions for similar work, our salary lists will have to be greatly increased merely to carry on the organization of the Museum as it now exists. If the Museum is hereafter to expect a reduction of income as great as it has suffered during the past year, a totally different scale of expenditures must be established if we would keep within the limits of our resources.

For the academic year 1894–95 our income has diminished fully fifteen per cent, leaving us a sum totally inadequate for so large an institution. We cannot hope to preserve the collections and properly care for them with a smaller staff than we at present employ for that purpose. We can only curtail our expenditures by limiting our publications and the purchase of books, by withdrawing all facilities now given for original research, and in fact by stopping the wheels of everything which has given it its activity in the past. Such a condition of things is greatly to be deplored; for it is very doubtful if the Museum could long retain the services of skilled Assistants or of a competent Director after its scientific usefulness was so seriously impaired by want of means.

ALEXANDER AGASSIZ.

CAMBRIDGE, October 1, 1895.

REPORT ON THE COURSES OF INSTRUCTION IN GEOLOGY.

DURING the Academic year 1894–95, the following named courses of instruction were given in the laboratories and in the field by the instructors of the Department of Geology.

Instruction in General Geology.

1. (Geol. 4.) A whole course in Elementary Geology; two lectures a week by N. S. Shaler, with a third lecture and an hour for special exercises by R. E. Dodge and R. A. Daly, and with required reading and field-work. Attended by two hundred and twenty-four students.

2. (Geol. 8.) A course in General Critical Geology; two lectures a week by J. B. Woodworth, with an additional hour for review. During the autumn and spring ten half-day excursions were made in the field to points in the vicinity of the University. Each student prepared a thesis during the winter months, and a map and report upon some locality in the neighborhood. Fourteen students took this course.

3. (Geol. 22 *a*.) A course in Field-work and Geological Surveying, designed to afford special training in original investigation, with work in the library and in the preparation of geological reports, conducted by Mr. Griswold, under the direction of N. S. Shaler, W. M. Davis, and J. E. Wolff. Conferences were held once a week during the year. It was attended by three students.

4. (Geol. 22 *b*.) An advanced course of research for special geological investigation in the field and laboratory, designed for second-year students who have already passed in the work of 22 *a*. The work in this course is under the personal supervision of the different instructors of the Department. It was attended by three students.

Instruction in Petrography.

5. (Geol. 12.) A course in Petrography, by J. E. Wolff, assisted by C. L. Whittle. Two lectures a week, with laboratory work, theses, and field-work. Attended by nine students.

6. (Geol. 23.) A course in Petrographic Research, by J. E. Wolff. Field and laboratory work. Attended by two students.

Instruction in Mining Geology.

7. (Geol. 10.) A course in Mining Geology, by H. L. Smyth. Lectures, laboratory and field work; half-course three times a week, beginning the first Monday in December and closing the last Friday in April. Attended by ten students.

8. (Geol. 11.) A course in Geological Surveying, by H. L. Smyth. Lectures, laboratory and field work, three times a week, beginning the first Monday in December and closing the last Friday in April. Attended by five students.

9. (Geol. 25.) A course in Mineral Veins and Metalliferous Deposits; their mode of occurrence, and theories of their origin; by J. D. Whitney. Lectures once a week, with additional laboratory hours and required reading and theses. Attended by four students.

Instruction in Palæontology.

10. (Geol. 14) A course in Palæontology, by N. S. Shaler, assisted in the laboratory by R. T. Jackson and C. R. Eastman. Three lectures and four hours of laboratory a week, with theses. This course was attended by seven students.

11. (Geol. 15.) A course in Historical Geology, designed to train advanced students in the use of fossils in determining geological horizons, by N. S. Shaler, assisted by R. T. Jackson and C. R. Eastman. This course was taken by four students.

Instruction in Meteorology and Physical Geography.

12. (Geol. 1.) A half-course in Elementary Meteorology, by W. M. Davis, assisted by R. DeC. Ward. Two or three lectures a week, with laboratory work and recitations, second half-year. Attended by seventy students.

13. (Geol. 2.) A half-course in Physical Geography, by W. M. Davis, assisted by L. S. Griswold. Two or three lectures a week, with laboratory work and recitations, first half-year. Attended by thirty-four students.

14. (Geol. 20.) A course in advanced Physical Geography, by W. M. Davis. Conferences held once a week. Attended by six students.

15. (Geol. 21.) A course in advanced Meteorology, by W. M. Davis. Conferences held once a week. Attended by one student.

16. (Geol. 6.) A half-course in the Physical Geography of the United States, by W. M. Davis. Lectures, library work, and reports, second half-year. Attended by eleven students.

Instruction in Special Geology.

17. (Geol. 16.) A course in Glacial Geology, by J. B. Woodworth. Lectures once a week, with additional hours for conferences, field and laboratory work. Attended by four students.

18. (Geol. 27.) A course in the Pre-Cambrian Geology of North America; with especial reference to the stratigraphy and economics of the rocks in the original Laurentian area, and the region of the Great Lakes, by H. L. Smyth. Three times a week. Attended by three students.

Summer Courses.

19. (Geol. S. 1.) A course in Elementary Geology, beginning July 5, and lasting six weeks, under the direction of N. S. Shaler, by R. A. Daly. Instruction was in the form of lectures, laboratory work, and field excursions. Besides the systematic lectures by Mr. Daly, special subjects were treated by Professors Whitney, Shaler, Davis, and Wolff, and Mr. Woodworth. Attended by sixteen students.

20. (Geol. S. 2.) An advanced course in field study of the Geology of the stratified rocks, beginning August 17, and continuing six weeks, at Utica, N. Y., by A. P. Brigham, Professor of Geology, Colgate University; at Catskill, N. Y., by H. B. Kümmel, of the New Jersey Geological Survey; and at Meriden, Conn., by L. S. Griswold. Attended by six students.

21. (Geol. S. 6.) A course in Physical Geography, beginning July 5, and lasting five weeks, by W. M. Davis. Lectures, laboratory work, and excursions. Attended by nine students.

22. (Geol. S. 8.) A course in Meteorology, beginning July 5, and lasting four weeks, by R. DeC. Ward. Lectures and laboratory work. Attended by one student.

REPORT OF THE STURGIS-HOOPER PROFESSOR OF GEOLOGY.

By Professor J. D. Whitney.

During the past year (1894–95), in accordance with the plan indicated in the Sturgis-Hooper Professor's last Report, a course of lectures, lasting through the year, was delivered by him. This course was entirely devoted to the subject of the Economical Geology of the metalliferous minerals, embracing the mode of occurrence, origin, and classification of the metals and their ores, and including statistics of their production throughout the world, as also a very condensed statement of the historical development of this branch of industry. This part of the course of Economical Geology having been expanded to twice its former length, it was possible to go much more fully into details than had ever before been done. As the course is now arranged, a student should, if properly fitted, be able to acquire during the two years given to the whole subject of applied geology, which necessarily embraces a considerable amount of applied chemistry, as much knowledge as seems necessary for one not making a specialty of either of these branches. That every geologist should have some general idea of the nature of mining operations and of the mode of occurrence of ores seems certainly most desirable, and that every chemist should have a corresponding amount of knowledge of the origin and distribution of the raw materials with which he has to do, as well as of the nature of metallurgical operations in the large way, seems equally important. In point of fact, however, the number of students who desire to take Economical Geology, and who are fitted for this work by previous elementary preparation, is but small, and seems to be growing smaller. There appears to be a growing inclination to neglect the practical side of geology and chemistry, and to take instead subjects which are purely theoretical, and in regard to some of which it can be said with truth that they have not yet become settled on a sufficiently solid basis of fact to be fit subjects for elementary teaching.

To get together as complete a library as possible in the department of Economical Geology has been, and still is, the aim and desire of the Sturgis-Hooper Professor, and it can be said with truth that there are but few important works in this line which cannot be found in the libraries at the Museum. Only two very desirable mining periodicals are wanting to complete sets. These are, the Journal of Mining, published by the Russian Government, and the Transactions of the North of England Institute of Mining Engineers. Of several of the more important older works published in England and Germany and devoted to mining geology, copies have been obtained, at last, after years of search. Miss H. S. Clark has continued, during the past year, the arrangement and cataloguing of this material, and a beginning has been made of classifying and cataloguing the manuscripts and pamphlets which have been collected for the purpose of illustrating the various topics embraced in the lectures on Economical Geology. Many of these works are rare and important. The value of this material is not yet thoroughly appreciated, but it will become so in proportion as more thorough work is found desirable in this department.

The Sturgis-Hooper Professor has given whatever time was available, after the preparation of his lectures and the superintendence of the work in the library, to the general topics in geology toward which his thoughts have been turned during the past years, the most important of which is that of historical climates, a subject which still remains involved in deep obscurity.

REPORT ON COURSES IN GENERAL GEOLOGY AND PALÆONTOLOGY.

By Professor N. S. Shaler.

During the past year Mr. Shaler has been compelled to devote a large share of his time to administrative tasks connected with scientific and academic work outside of the department, in addition to his duties as Professor of Geology. As Dean of the Scientific School, Chairman of the Committee on the Summer School, President of the American Geological Society, and member of the Massachusetts Highway Commission, he has been called on to do a considerable amount of executive labor. The result of this is shown in the small amount of publication which he has made. In addition to the few papers noted in the list, he has however brought substantially to completion, with the assistance of Mr. J. B. Woodworth and Dr. A. F. Foerste, a memoir long in hand concerning the Narragansett Basin, which is to be published by the U. S. Geological Survey. He has also sent in to the same Survey a paper for the Annual Report of 1894–95, concerning the Road Building Stones of Massachusetts. On this work he has had the collaboration of Mr. L. W. Page.

Mr. Dodge reports regarding the course in General Geology substantially as follows. During the past year, extensive additions have been made to the laboratory materials for students' use and for reference, by gift, by personal collection, and by purchase. Among the gifts, should be mentioned a number of stalactites, concretions, and friable sandstone, from Prof. J. A. Merrill, of the State Normal School, Warrensburg, Mo.; and twenty geological maps from Dr. C. Willard Hayes, U. S. Geological Survey. All specimens for students' use have been procured in sets of fifty, each set being numbered alike. All the collections, old and new, have been numbered and catalogued, following the system employed by Dr. Jackson in the palæontological collections. While the teaching collections have thus been placed in good condition, large table specimens for class illustration are still needed; and a small series of fossils especially designed for use in the elementary course would be useful in avoiding the present practice of borrowing from the collections primarily intended for the palæontological courses. A clinometer-compass was designed especially for the use of students in their field-work; it is now made by Messrs. Keuffel and Esser of New York. The laboratory and field work in the elementary course have been somewhat changed from last year's plan; more attention has been given to study of rock specimens indoors, and to the construction of field maps outdoors. The Pondville locality of carboniferous rocks in Norfolk County has been included in the excursions, of which eleven were made, the class being divided into small sections for this purpose.

Mr. Dodge gave a course in elementary geology to a class of sixteen students in Radcliffe College; the plan of the course was similar to that given to the Harvard College students, and this year for the first time equivalent laboratory opportunities were given to the two classes.

During the summers of 1894 and 1895, Mr. Dodge has acted as assistant to Dr. C. W. Hayes in geological field-work in Tennessee. At the close of the past year he resigned his position as Instructor in Geology at Harvard to accept the instructorship in geography and geology in the Teachers College, New York City.

Dr. R. T. Jackson reports substantially as follows concerning the courses in Palæontology. The teaching collections have been increased by various additions, and arranged throughout in a manner that much facilitates their use by students. A moderate number of palæontological books and papers have been added to the working library. The Museum library has deposited with these collections, as a permanent loan, fifty-eight diagrams, including fifty-six palæontogical diagrams by Zittel; these have now been mounted on rollers. The following gifts are acknowledged. A collection of fossils and rock specimens from Dr. T. W. Harris, including specimens from localities not before represented, and samples of the unfossiliferous layers of our palæozoic formations. Some specimens needed to fill gaps have been received from the Museum of Comparative Zoölogy. Mr. B. S. Oppenheimer gave a small collection of fossil gums, other than amber, from localities of economic interest. Prof. A. P. Brigham, of Colgate University, presented a lot of fossils from the Devonian of New York. Gifts were also received from Prof. A. Hyatt, Dr. C. R. Eastman, and Messrs. R. E. Dodge, J. B. Woodworth, J. H. Sears, and F. M. Lowe. Purchases of material include sixty species of fossils from the coal measures of Peoria, Ill., mostly Invertebrates; a number of well preserved Trilobites and Brachiopods, showing spires, hinge structure, muscular impressions, etc.

The most pressing needs of the palæontological collections in use by the instructors are well preserved fossils showing structural details, and microscopic sections of fossils exhibiting minute structure. Additional cases are needed for storage. Several palæontological reports of State surveys, constantly in demand in the laboratory, could with advantage be added to the working library.

Dr. Jackson spent a considerable share of his time working in the palæontological department of the Museum of Comparative Zoölogy. During his sickness, in the autumn and early winter, he was replaced by Dr. C. R. Eastman, who resigned a fellowship at Yale in order to assist the department at this time of need; for the remainder of the year Dr. Eastman was occupied on collections of fossil Vertebrates in the Museum.

During the past year, Mr. J. B. Woodworth was in charge of the second course in General Geology (Geol. 8) and of the course in Glacial Geology (Geol. 16). Owing to the destruction of several of the most instructive geological exposures in the immediate vicinity of the University by the advance of quarrying and grading, it has been necessary to visit more distant points in the excursions of Course 8. The Carboniferous rocks of the Norfolk County Basin, at Pondville and Canton Junction, were selected for new teaching localities. During the April recess, a voluntary excursion — allowed to count as the equivalent of four spring half-day excursions — was made to the Cambrian and Carboniferous rocks near Attleborough, Mass.

Course 16, Glacial Geology, was given to four students for the first time this year. It was devoted mainly to a study and exposition of the glacial deposits as they exist in this country, with particular reference to training students in the discrimination and description of these deposits, and of attendant glacial phenomena in the field. The University is favorably located for this kind of investigation, and with the recent advances made in the interpretation of the stratified drift deposits, almost every square mile in Eastern Massachusetts affords opportunity for instruction. One student examined the brick clays about Boston, and confirmed an earlier unpublished conclusion of the instructor that they are older than the last glacial deposits, including the drumlins, and that they are likewise of glacial origin. Work was also done in Rhode Island in tracing boulder moraines. The results of these investigations will be embodied in forthcoming publications.

A course equivalent to Geology 8 was given to two students of Radcliffe College.

Mr. Woodworth's time, when not employed in teaching, has been given to the completion of a map and report upon the Carboniferous Rocks of the southeastern part of Massachusetts and Rhode Island, in collaboration with and under the direction of Professor Shaler, for the U. S. Geological Survey.

The following papers are in preparation as the result of investigations carried on or brought to a close during the year: —

The Stratigraphic Succession in the Rhode Island Coal Area.

On the Fracture System of Joints in Pelites.

The Glacial Sand-Plains of Narragansett Bay.

The Geology of Block Island.

Geological Field-Work.

During the past year research in general geology has been carried on in two classes: Geology 22 *a*, comprising students just entering upon research work in the University, and Geology 22 *b*, including more experienced men. In 22 *a* the work was closely supervised by Mr. Griswold, and the students individually were given considerable time in field and laboratory by the instructor. In the fall, work in the Boston Basin gave valuable results, and one paper was published, "The Southwestern Part of the Boston Basin," by Mr. J. L. Tilton, in the Proceedings of the Boston Society of Natural History. During the spring season a considerable part of the Nashua Basin was studied, and interesting features of structure and metamorphism determined. In Geology 22 *b* the men followed work of their own choice with the advice of a selected instructor. Mr. H. I. Richmond continued the work of a previous year upon New England shore lines. Mr. C. F. Marbut pursued work upon the geology of part of Missouri for publication by the State Geological Survey. Mr. Marbut is now Instructor in Geology at the Missouri State University, and is also connected with the Missouri Geological Survey. Mr. Tilton has returned to his position as Professor of Natural Science in Simpson College, Indianola, Iowa.

A trip made by Mr. Griswold through the West during the past summer has been fruitful in the way of geographical and geological observation. Visits were made to the Arizona plateau, in the neighborhood of the Grand Canyon of the Colorado and the San Francisco Mountains; to the Pacific slope, with sections across the Sierra Nevada and the Cascade ranges to the interior basins; to the desert regions of Idaho, Utah, and Arizona; and to the Rocky Mountain plateau in Montana, Wyoming, and Colorado. During this excursion an address was made to the Teachers' Institute of Lewis and Clarke County, Montana, on Geology in a Common School Education.

REPORT ON COURSES IN THE SUMMER SCHOOL.

The department has this year somewhat increased its offering of courses which may be pursued during the summer vacation. The aggregate attendance on these courses was thirty-two. The greater part of the instruction was given by officers of the department, all those in service taking some share in the work. It was, however, as heretofore, found necessary to call on others for aid in the second summer course in Geology. The department is indebted to Prof. A. P. Brigham of Colgate University, and to Dr. H. B. Kümmel of the New Jersey Geological Survey, for instruction at Utica and Catskill respectively.

REPORTS OF SUB-COMMITTEES.

THE more formal departmental business has been carried on in meetings that have been held on the evening of the second Tuesday of each month, after the close of the geological conference. The subjects thus discussed have been plans of courses for the coming academic year, recommendations of applicants for graduate scholarships and fellowships, and the development of the departmental resources. Special consideration by sub-committees has been given to several subjects. The field-work introduced in the various courses has been carefully revised by Professor Shaler and the instructors engaged in this branch of teaching, with the object of securing for those students who give a large share of attention to geology a systematic acquaintance with the features of our neighborhood. A general revision has been made by Messrs. Dodge, Jackson, and Woodworth of all the geological maps in the various libraries and laboratories, in the hope of completing a central collection: all the maps of this kind belonging to the department have been arranged and catalogued, and a rough list has been made of similar maps in the College Library. It is hoped that a special appropriation may be made by the University Library Council for the purchase of foreign geological maps during the coming year, thus continuing the systematic growth of our collections in the manner already so successfully applied in the collection of foreign large-scale topographical maps. Mr. A. L. Rotch of the Blue Hill Observatory has kindly acted with Mr. Ward in looking over all our meteorological materials, in order to concentrate climatological works in the library of the Harvard College Observatory, where a large collection of such material already exists; the College Library is thus relieved of a certain responsibility, and enabled to extend its collection of general meteorological publications.

The report of the sub-committee on the Gardner Collection of Photographs, Messrs. Woodworth, Griswold, and Dodge, shows a great improvement in the condition of the collection, and a considerable increase in its size. All the photographs are now arranged in geographical order in large folios; a list of accessions and a systematic card catalogue are maintained. It is now proposed to select those views that are most frequently used in teaching, and keep them aside from the general collection, protecting them by adjustable covers. An exhibition of representative general views is also contemplated, and a selection of local views is proposed for exchange with similar collections from other institutions. Many new lantern slides have been secured; some by purchase, as the set illustrating the Great Barrier Reef of Australia, from the negatives of Mr. Kent, some by copying photographs in the general collections. These slides are continually in use in our various courses for class illustration. The negatives from which many slides are made are preserved and catalogued, so that they can easily be duplicated. The committee is under obligations to Professor William Libbey, Jr., of Princeton, for prints of his Hawaiian views and of those he obtained on the Peary Relief Expedition to Greenland in 1894; to Professor I. C. Russell, of Ann Arbor, for the set of views in the Malaspina District of Alaska; to Dr. C. Hart Merriam of the Department of Agriculture, Washington, for the privilege of copying his collection of views from Death Valley, Cal.; to Mr. F. H. Newell, of the United States Geological Survey, for a similar privilege with certain views illustrating irrigation; to Mr. Edward L. Wilson, of New York City, for the gift of a number of views of Natal and the Azores, as well as for assistance in procuring views from South Africa and New Zealand. About six hundred and fifty pictures have in all been added to the collection during the year.

REPORT ON COURSES IN MINING GEOLOGY.

By Assistant Professor H. L. Smyth.

The courses in Mining Geology and allied subjects given by Mr. Smyth were, by arrangement with the Department of Chemistry, held in the Mineralogical Lecture Room of the University Museum. The three courses began early in December, 1894, and ended in the April recess, 1895; the open season before and after these dates being reserved by Mr. Smyth for his own field-work and other studies. During the April recess, a voluntary excursion was made for the benefit of the students in the course on Mining Geology to Pennsylvania and New Jersey, in the course of which the nickel mine at Lancaster Gap, the iron mines at Cornwall, several blast furnaces at Lebanon, the Bethlehem Iron Works at South Bethlehem, the zinc deposits at Franklin, and the experimental magnetic concentrating plant at Ogden were visited, the latter by the permission of Mr. Edison.

During the year the scientific library of Professor Raphael Pumpelly was made accessible to the students in these courses, as well as to those in the courses in Mineralogy, the Department of Mineralogy having provided the room in which the library is temporarily installed in the University Museum. The collection includes upwards of three thousand bound volumes, besides numerous pamphlets and maps; it is especially strong in economic geology, metallurgy, and mineralogy.

Numerous additions have been made to the collections of mine maps and of photographs illustrating the structural relations of ore bodies. A number of typical specimens of ores were collected. About one hundred thin sections were added to the series available for study in the course on Pre-Cambrian Geology.

The most pressing need in these courses is room for the proper storage and arrangement of geological specimens, so that they can be conveniently examined by students. During the past year two rooms in the basement of the University Museum were used for these purposes; but in the coming year the rooms will be needed by the Department of Mineralogy and Petrography. A number of nstruments are needed in the course on geological surveying.

REPORT ON COURSES IN PETROGRAPHY.

BY PROFESSOR J. E. WOLFF.

THE usual courses were given in Elementary Petrography (Geol. 12) and in Advanced Petrography by Professor Wolff, assisted by Mr. C. L. Whittle. The former course was attended by nine students and the latter by three.

Original work was carried on by Mr. R. A. Daly in the preparation of a Monograph on Ascutney Mountain, Vermont, and in completing some work on the Porphyritic Gneiss formation of New Hampshire. Mr. C. F. Marbut investigated the microscopic characters of some siliceous limestones and allied rocks.

Field work in the Archæan Highlands of New Jersey in connection with the United States Geological Survey has been carried on by Professor Wolff in the summer, and during the winter considerable time was devoted to the preparation of a joint Monograph on the Crazy Mountains, Montana, in collaboration with Mr. Walter H. Weed.

The subjects of Mineralogy and Petrography, of which the former has been placed under Chemistry and the latter under Geology, were in June united to form a new department of instruction, named the "Department of Mineralogy and Petrography," and placed in the Division of Natural History. This union of two closely connected subjects will prove a great advantage both as regards instruction and investigation and economy of resources. The two chemical laboratories belonging to each separately have thus been united into one in the Mineralogical Section of the Museum, and an excellent laboratory for mineral and rock analysis will thus result. In the same way, a joint library has been formed by uniting the two previously separate partial libraries, and the collections and apparatus will be used to better advantage.

REPORT ON COURSES IN PHYSICAL GEOGRAPHY.

By Professor W. M. Davis.

The courses of instruction in charge of Professor Davis have been carried on in much the same manner as in previous years. In Elementary Physical Geography, Mr. L. S. Griswold has acted as Assistant, while in Elementary Meteorology this duty has been performed by Mr. R. DeC. Ward. A new half-course in the second half-year on the Physical Geography of the United States was offered for the first time: it was given by lectures in the Geographical Laboratory, where maps and photographs could be conveniently displayed. The chief subjects discussed in the advanced course in Physical Geography were the features of shore lines, and their use as criteria of uplift and depression, this being the subject of the thesis in preparation by Mr. Gulliver; the physical features of Missouri, in which Mr. Marbut of the Missouri Geological Survey introduced a number of original observations; the Physical Geography of New York State, by Mr. Kennedy; the Alleghany Plateau, by Mr. Abbe; and the Physical Geography of Utah, by Mr. Tanner. In the advanced course in Meteorology, Mr. Schoenfeld made what may be called a meteorological section of Africa from north to south, from which it appears clear that the southwest monsoon of the northern summer is well developed in the interior of the continent for a number of degrees north of the equator.

The chief addition to the collection of laboratory materials has been a number of grouped sheets of the Topographical Map of the United States; these proved to be invaluable in the course on the Physical Geography of our country. The laboratory has lately been uncomfortably crowded by the necessity of storing there a number of maps and models that have been previously kept in the Geological Exhibition Room, on the floor below. There is at present no adequate provision for the exhibition of these excellent geographical illustrations.

The visit to Europe made by Professor Davis in the summer of 1894 supplied a number of photographs, taken by himself, and since then reproduced in lantern slides; those illustrating certain details in the process of the migration of river divides along the margin of the Swabian Alp in Würtemberg being especially useful. The same visit served as the basis of two studies on the natural history of rivers: one on certain rivers in England, mentioned in the list of publications given below; the other on the Seine, the Meuse, and the Moselle, shortly to be published in the "Annales de Géographie" of Paris, and in the "National Geographic Magazine" of Washington. The latter subject served also as the title of a lecture before the National Geographic Society in February last.

Following a plan laid in the spring of 1894, a course of informal lectures on "Meteorology in the Schools" was given by Professor Davis and Mr. Ward, to an audience of about thirty teachers selected from the Cambridge Grammar Schools. This course was originated by a committeee of the New England Meteorological Society, in order to promote instruction in Elementary Meteorology. The course was repeated by Mr. Ward to the teachers of Hingham, Mass. Good results are believed to have followed these efforts. A considerable measure of time was given during the winter by Professor Davis to supervision of the physical element in Frye's "Complete Geography," lately published by Ginn & Co.; the share of attention allowed to Physical Geography being much greater than is commonly the case in grammar school text-books.

For the first time in several years, Professor Davis took part in the summer courses of instruction, offering the subject of Physical Geography. Although the class numbered only nine, two women and seven men, the spirit of the work was encouraging in the highest degree. Lectures were given daily in the laboratory, followed by various practical exercises on maps, models, books, etc. Excursions were made to Nantasket, Newtonville, Provincetown, and the Connecticut and Deerfield valleys, giving good opportunity for the study of a variety of geographical forms in the field. A brief interruption was made during the progress of the course, in order that the instructor might give three lectures in the State Summer School at Norwich, Connecticut.

PUBLICATIONS BY MEMBERS OF THE GEOLOGICAL DEPARTMENT SINCE THE LAST REPORT.

By N. S. Shaler: —

Report of the Work done in the Atlantic Coast Division of the U. S. Geological Survey for the year ending June 30th, 1893. Fourteenth Annual Report of the Director, U. S. Geological Survey, Part I. pp. 194–197. Washington, 1893.

Evidences as to Change of Level. Bull. Geol. Soc. Amer., Vol. V. pp. 141–166. January, 1895.

Second Annual Report of the Mass. Highway Commission. Public Document, No. 54, January, 1895, pp. 68. (With George H. Perkins and W. E. McClintock.)

Edited Geological Terms in the Standard Dictionary of the English Language, Vol. II. 1895. (With Prof. W. B. Dwight and J. B. Woodworth.)

By William M. Davis: —

Note on Croll's Glacial Theory. Trans. Geol. Soc. of Edinburgh, 1894, Vol. VII. pp. 77–80.

Meteorology in the Schools. School Review, November, 1894, Vol. II. pp. 529–539.

The Ancient Outlet of Lake Michigan. Pop. Sci. Mo., December, 1894, Vol. XLVI. pp. 217–229.

The Development of Certain English Rivers. Geographical Magazine (London), February, 1895, Vol. V. pp. 127–146.

The Education of the Topographer. Science, 17 May, 1895, (New Series,) Vol. I. pp. 546, 547.

Need of Geography in the University. Educational Review, June, 1895, Vol. X. pp. 22–41.

Current Notes in Physiography. Science, 15 February, 1895, and following numbers.

By J. E. Wolff: —

Geology of the Green Mountains in Massachusetts. By Raphael Pumpelly, J. E. Wolff, and T. Nelson Dale. Monograph 23 U. S. Geological Survey, 4to, 206 pp., 23 pl. (Part II., "The Geology of Hoosac Mountain," by J. E. Wolff.)

By H. L. Smyth: —

The Quartzite Tongue at Republic, Michigan. Journal of Geology, Nov.—Dec., 1894.

The Republic Trough. Chapter IV. of an article on the Marquette Iron District, Fifteenth Annual Report of the U. S. Geological Survey. [In press.]

The Geological Structure of the Western End of the Vermilion Range. [With J. R. Finlay.] Transactions of the American Institute of Mining Engineers, Atlanta Meeting, October, 1895. [In press.]

By R. DeC. Ward: —

1. Distribution of Thunderstorms over the Earth's Surface. Bulletin of the New England Weather Service, October, 1894.
2. Recent Foreign Studies of Thunderstorms: Russia. Am. Met. Jour., February, 1895, Vol. XI. pp. 364–358.
3. Recent Foreign Studies of Thunderstorms: Switzerland. Am. Met. Jour., April, 1895, Vol. XI. pp. 435–441.
4. Edited the American Meteorological Journal. An Illustrated Monthly devoted to Scientific Meteorology and Allied Branches of Study. Vol. XI. Boston, Ginn & Co., 1894–95.

By L. S. Griswold: —

Origin of the Arkansas Novaculites. Proc. Bost. Soc. Nat. Hist., February 9, 1895. 8 pp.

Origin of the Lower Mississippi. Proc. Bost. Soc. Nat. Hist., May 14, 1895. 5 pp. and Map.

By J. B. Woodworth: —

1. Edited Geological Terms in The Standard Dictionary of the English Language, Vol. II., 1894. (With Professors Shaler and W. B. Dwight.)
2. The Relation between Baselevelling and Organic Evolution. The American Geologist, Vol. XIV., 1894, pp. 209–235.
3. Notices of two Papers by John H. Sears. The American Geologist, Vol. XV., 1895, pp. 264–266.
4. April Recess Excursion. The Harvard Graduates' Magazine, Vol. III., June, 1895, pp. 538, 539.

By R. T. Jackson and T. A. Jaggar: —

Arrangement and Development of Plates in the Melonitidæ. Abstract. Amer. Geol., Vol. XV. No. 4, October, 1895, pp. 239, 240.

REPORT ON THE INSTRUCTION IN ZOÖLOGY.

By Professor E. L. Mark.

As in previous years, the number of students from each of the various classes completing the several courses in Zoölogy is given in tabular form.

Courses.	Grad.	Sen.	Jun.	Soph.	Fr.	Spec.	Sci.	Total.
Zoöl. 1	4	8	15	25	37	5	33	127
" 2	3	7	7	21	4	2	14	58
" 3	1	3	5	1	0	0	13	23
" 4	4	3	1	1	0	0	5	14
" 5	3	3	1	1	0	0	5	13
" 6	5	4	0	0	0	0	0	9
" 7	5	2	1	0	0	0	3	11
" 20*a*.	8	1	0	0	0	0	0	9
" 20*c*.	0	0	1	0	0	0	0	1
Totals	33	31	31	49	41	7	73	265

During the year 1894–95 there was an increase over the preceding year in the number of students taking Zoölogy, which was fairly evenly divided among the different courses.

Zoölogy 1 was conducted by Dr. C. B. Davenport, without material changes from the course as given in the previous year. His Assistants were: Chief Assistant, Mr. H. V. Neal; Sub-Assistants, Messrs. S. K. Fenollosa, J. M. Prather, and F. H. Pratt. The limit of accommodations in laboratory work in this course has been reached, and any further increase in numbers will have to be met by providing a supplementary room for the excess.

Dr. G. H. Parker had charge of Zoölogy 2, and his Assistant was Mr. H. S. Jennings. The animals studied and the laboratory methods pursued were substantially as in former years.

Dr. Parker also conducted Zoölogy 3, as in the year 1893–94. He was assisted in the laboratory work by Mr. W. B. Cannon. The only considerable change in the laboratory work was an increase in the time given to special-topic work from four weeks to six weeks. In connection with this course a paper was prepared by Dr. Parker and Mr. R. Floyd on the Preservation of Mammalian Brains by Means of Formol and Alcohol, which will appear in the "Anatomischer Anzeiger."

The demand for instruction in microscopical technique exceeded the accommodations of the room devoted to that work, so that it was with considerable inconvenience that places — some of which were unsuitable — were provided for most of the applicants for Zoölogy 4. In this course Dr. W. McM. Woodworth, as usual, had charge of the laboratory work and gave part of the lectures.

Zoölogy 5 was elected by all the students who took Zoölogy 4, except in the case of a Graduate student in Botany. Dr. Woodworth conducted the laboratory work in this course also. His duties were considerably greater than in previous years, owing to the increased size of these two classes.

In Zoölogy 6, by Dr. Davenport, there were four constant attendants upon the lectures, who were not regularly enrolled, and who undertook no laboratory work. In connection with this course the following paper, among others, was prepared: On Acclimatization of Organisms to Poisonous Chemical Substances. By C. B. Davenport and H. V. Neal.

It is intended to divide the subject matter of this course in the future, so that those problems of Morphogenesis which relate to the development of the individual (Ontogenetic Part) and those which relate to the evolution of the race (Phylogenetic Part) shall be treated of in alternate years. This will allow a more thorough and exhaustive treatment of the whole field, and will be equivalent to offering to advanced students an additional course.

Zoölogy 7 consisted in a course of lectures by Dr. Parker, given in the first half-year, as previously, and covering the same ground. It is proposed in this course, also, to divide the subject so that in alternate years the lectures will be different. These will consist of a general introduction to the study of the nervous system, followed by a fuller treatment of one or more of its main divisions. In the introductory lectures the following topics will be presented: —

(1) Methods for the study of the nervous system.

(2) General structure and functions of the nervous system.

(3) Types of sense organs and the origin of afferent impulses.

(4) Central organs and the transmission and translation of impulses.

(5) Terminal organs of efferent nerves: muscles, luminous organs, glands, etc.

The topics for more extended consideration will not be the same in successive years. The special topic for 1895–96 will be the Sense Organs.

An account of the work in Zoölogy 20 *c* is contained in the Report on Osteology, by Dr. Slade.

All the students engaged on special problems (Zoölogy 20 *a*) made satisfactory progress in their work, except in the case of one Scientific School student, who was compelled by the condition of his eyes to give up Zoölogy.

The degree of Doctor of Philosophy was conferred at the last Commencement upon three students in Zoölogy, two of whom now have college positions. The degree of A. M. was conferred on four zoölogical students.

The Zoölogical Club seems to have become a permanent and valuable adjunct to the department. Its meetings are well attended, and the interest in them does not diminish.

By a special appropriation from the Corporation of the University, and a generous gift from the Curator of the Museum, it was possible to publish in the Museum Bulletin a portion of the Contributions from the Zoölogical Laboratory that had not been provided for at the end of last year. The Contributions published since my last report are, Nos. XLII.–XLIX., as follows: —

XLII. On the Cell Lineage of the Ascidian Egg. A Preliminary Notice. By W. E. Castle. Proc. Amer. Acad., Vol. XXX. pp. 200–216. 2 Pls. October, 1894.

XLIII. On the Blastodermic Vesicle of Sus scrofa domesticus. By A. W. Weysse. Proc. Amer. Acad., Vol. XXX. pp. 283–323. 4 Pls. December, 1894.

XLIV. Spermatogenesis of Caloptenus femur-rubrum. Preliminary Notice. By E. V. Wilcox. Anatomischer Anzeiger, Bd. X. No. 9, pp. 303, 304. Dec. 19, 1894.

XLV. On the Introitus Vaginæ of certain Muridæ. By Gerrit S. Miller, Jr. Proc. Bost. Soc. Nat. Hist., Vol. XXVI. pp. 459–468, Pl. 5. February, 1895.

XLVI. Studies in Morphogenesis. — III. On the Acclimatization of Organisms to high Temperatures. By C. B. Davenport and W. E. Castle. Archiv für Entwickelungsmechanik der Organismen, Bd. II. Heft 2, pp. 227–249. July 23, 1895.

XLVII. Spermatogenesis of Caloptenus femur-rubrum and Cicada tibicen. By E. V. Wilcox. Bull. Mus. Comp. Zoöl., Vol. XXVII. No. 1, pp. 1–32. 5 Pls. May, 1895.

XLVIII. On the Early Development of Limax. By C. A. Kofoid. Bull. Mus. Comp. Zoöl., Vol. XXVII. No. 2, pp. 35–118. 8 Pls. August, 1895.

XLIX. On Stichocotyle Nephropis, Cunningham. By W. S. Nickerson. Zoologische Jahrbücher, Abth. f. Anat. u. Ontogenie, Bd. VIII. Heft 4, pp. 447–480, Taf. 29–31. July 30, 1895.

Nos. XLIII., XLVII., and XLVIII. were presented as Theses for the degree of Ph. D.

Of the Contributions, Nos. L. to LVI. are either in press or ready for the printer.

The need of a permanent fund for the publication of the Contributions, set forth in my last report, is still urgent.

REPORT ON OSTEOLOGY.

By Daniel Denison Slade.

During the past year no progress has been made in additions to the osteological collections. They remain in essentially the same condition as at the last report, owing to the lack of means for the maintenance and and increase of the valuable material.

The plan proposed two years ago of making the course of Comparative Osteology one of research, thereby offering the highest usefulness of the Museum to those who wished to pursue original investigations, has been pursued during the academic year. A few only have availed themselves of the opportunities thus liberally offered, a fact which has satisfactorily proved that there was little or no interest in the work required. In addition to this singular apathy manifested by students who must necessarily appreciate and value the knowledge so essential in their zoölogical studies, it should be stated that during a prolonged illness in the winter months, which prevented my attendance in the department, certain irregularities occurred which has led the Curator of the Museum to pass more strenuous rules, which must hereafter govern both assistants and students in all the collections. For those fitted for the proper pursuit of their work, it is probable that ample opportunities will still be presented in the Osteological Department.

A paper, "The Significance of the Jugal Arch," originally intended for publication in the Museum Bulletin, was read before the American Philosophical Society, March 15, 1895, and published in their Proceedings, Vol. XXXIV.

A paper, "Abnormal Attachment of the Atlas to the Base of the Skull," published in the Boston Medical and Surgical Journal, July, 1895, has been reprinted.

REPORT ON THE MAMMALS AND BIRDS.

By William Brewster.

The collection of Mammals has received the following additions during the past year: —

By purchase. A fine Burchell's Zebra (*Equus burchellii*), mounted by Roland Ward, of London; a Wolf (*Canis lupus*), from Siberia, and a Virginia Deer (*Cervus virginianus*), from Moosehead Lake, Maine, mounted by J. T. Clark; and skins of a Bear and Land Otter from Japan, furnished by Alan Owston, of Yokohama.

By gift. From Mr. F. L. Omstead, Jr., an alcoholic specimen of a Star-nosed Mole (*Condylura cristata*), obtained at Biltmore, North Carolina; from Dr. L. C. Jones, the skin of a Black Squirrel (*Sciurus niger*), said to have been taken at Melrose, Mass., October 28, 1894.

Of birds the Museum has received the following: —

By gift. From Mr. Thurlow Washburn, upwards of two hundred skins, chiefly from New Jersey and Colorado; from Mr. George A. Dorsey, of the Peabody Museum, seven especially fine and valuable skins from British Guiana; from Mr. D. F. Turnbull, of the Lawrence Scientific School, skins of a Tanager (*Rhamphocelus*), a Manikin (*Pipra*), and a Jacomar (*Galbula*) from the island of Pedernales in the Delta of the Orinoco; from Mr. W. E. D. Scott, eight skins from Panama, collected by Mr. Matthew H. Simons, U. S. N.; from Mr. Walter Faxon, a mounted Black and Yellow Warbler (*Dendroica maculosa*), from Revere, Mass.; and a mounted Black-throated Blue Warbler (*Dendroica cærulescens*), and a nest of the Solitary Vireo (*Vireo solitarius*), from Arlington, Mass.; from Mr. R. T. Jackson, the skin of a young Cuckoo (*Coccyzus erythropthalmus*), from Swampscott, Mass.

By purchase. Thirteen skins representing twelve species of Japanese birds, furnished by Alan Owston.

Unfortunately Mr. Washburn's collection proved on examination to be in such bad condition, owing to the ravages of moths and other insect pests, that only twenty-six specimens, representing twenty-two species, could be retained.

Still more unlucky was the fate which befell a collection of Western birds, chiefly from Colorado and Arizona, which Mr. George L. Toppan, of Chicago, formally presented to the Museum last April. This collection contained about one thousand skins, and included many rare and valuable specimens; but before it could be packed and forwarded to Cambridge it was wholly destroyed by the burning of the storage warehouse in which it had been temporarily placed.

Early in the present year Mr. Scott obtained funds sufficient to begin his artistic collection of mounted birds. Indeed, he has made much more than a beginning, for he has already placed on exhibition in one of the Exhibition Rooms no less than fifty-six cases containing about one hundred and seventy-five specimens. These are mounted in spirited and original attitudes, for Mr. Scott disregards the conventions of his art and models his birds after his own ideas and impressions. Many of his subjects are very lifelike, and the best are masterpieces. With respect to what are technically called "accessories" — that is, the branches, stumps, rocks, etc., on or among which the birds are placed — Mr. Scott's taste is severely simple and hence altogether admirable. It is to be hoped that nothing will occur to prevent him from carrying out his plans for the further increase and elaboration of this collection, for it can scarcely fail to become one of the chief popular attractions of the Museum.

The Assistant in this Department has published the following notes and papers in "The Auk": —

Notes and Song-flight of the Woodcock (*Philohela minor*).

Breeding of the Prairie Horned Lark (*Otocoris alpestris praticola*) near Pittsfield, Mass.

Notes on the Habits of the Northern Shrike (*Lanius borealis*).

A remarkable Plumage of the Prairie Hen (*Tympanuchus americanus*).

Notes on Certain Flycatchers of the Genus *Empidonax*.

The White Gyrfalcon in New England.

Second Occurrence of Harris's Sparrow (*Zonotrichia querula*) in British Columbia.

A Ground Nest of the Black-throated Green Warbler.

Notes on Birds observed in Trinidad (by William Brewster and Frank M. Chapman).

A remarkable Flight of Pine Grosbeaks (*Pinicola enucleator*).

The Assistant has also edited a second edition of Mr. H. D. Minot's "Land Birds and Game Birds of New England," which appeared in March, 1895.

REPORT ON THE REPTILES AND FISHES.

By Samuel Garman.

Additions to the collections in these departments have been received from Mr. Phillip Adams, Outram Bangs, Esq., Mr. Ralph Brandreth (through the favor of Dr. Wm. M. Woodworth), Hon. E. T. D. Chambers, William Clapp, Esq., Miss Annie E. Cutler, Clarence M. Dyer, Esq., Prof. H. Garman, Dr. L. C. Jones, Mr. T. I. Potts (through the kindness of Prof. F. W. Putnam), Mr. Robert K. Smith, M. P. Thompson, Esq., Mr. Arthur R. Torrey, the United States Fishery Commission, and the United States National Museum. Those received from the National Museum were in greater part rare forms or types of species secured in the investigations of the United States Fishery Commission Steamer "Albatross"; those sent by the Commissioners were mainly fishes from inland waters collected in explorations of the Southwestern States. The contributions of Messrs. Bangs and Potts are particularly interesting on account of the localities represented. By purchase a number of fine live specimens were obtained, desiderata for the Exhibition Rooms. Professor Goode and Dr. Bean, having finished their work on them, have returned the Blake Collections to this Museum, with the exception of such duplicates as were retained for the National Museum.

Certain collections belonging to the University of Iowa, gathered by Professor C. C. Nutting, were received some time ago, to be subjected to comparative study and publication.

The ichthyological work begun for the Museum last season, with the drawing and engraving, has been continued to the present date.

The loss from evaporation, leakage, or breakage has been less than in any previous report.

In addition to unsigned reviews and book notices, the following papers, exclusive of that on the Cyprinodonts, have been published in the Memoirs of the Museum since my last report: —

The Suspended Animation of Snakes. Nature, Jan. 17, 1895, p. 274.
Thirst Endurance in some Vertebrates. Nature, Feb. 1, 1895, p. 343.
Lobster Reproduction. Zoologischer Anzeiger, No. 467.

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

By Samuel Henshaw.

Acknowledgments are due Miss C. G. Soule, Messrs. A. L. Babcock, Outram Bangs, S. A. Beach, H. K. Burrison, C. B. Davenport, G. A. Dorsey, W. L. W. Field, J. W. Freese, H. Garman, S. Garman, G. L. Goodale, Roland Hayward, G. H. Horn, G. de N. Hough, J. G. Jack, C. W. Johnson, A. G. Mayer, A. P. Morse, B. L. Robinson, S. H. Scudder, F. A. Sherriff, Chauncey Smith, L. Y. Swett, Roland Thaxter, S. Watase, and H. E. Weed, for donations to the collection of the Department.

To Messrs. Godman and Salvin we are especially indebted for another instalment of Central American Coleoptera. The series received includes the Buprestidæ and several families of the Heteromera.

The increased use of both the collections and library, noted last year, has continued; as many as seven persons have taken advantage of the facilities of the Department in a single day, and the average throughout the year is more than two for each day the collection has been available.

Assistance, either by the loan of material or in other ways, has been given Messrs. J. E. Chase, J. H. Comstock, C. H. Fernald, W. J. Fox, F. L. Harvey, G. de N. Hough, J. G. Jack, C. W. Johnson, A. G. MacGillivray, A. P. Morse, A. S. Packard, F. C. Paulmier, Theodore Pergande, S. H. Scudder, F. A. Sherriff, Roland Thaxter, and the Biological Department of Wellesley College.

The entire collection is remarkably free from museum pests, a result due to Miss Parker's care. When not engaged in inspecting the collection, Miss Parker's time has been wholly employed in remounting and labelling specimens of Microcoleoptera.

The routine work has consisted of a revisional arrangement of (1) the Danaidæ, Satyridæ, and Morphidæ of the Lepidoptera Rhopalocera; (2) the families of the Pyralidina and of the Tineina of the Lepidoptera Heterocera; (3) the Dixidæ, Rhyphidæ, Xylophagidæ, Cœnomyphidæ, Tabanidæ, Leptidæ, Midaidæ, Nemestrinidæ, Bombylidæ, Therevidæ, Scenopinidæ, and Cyrtidæ of the Diptera; and (4) the Cicindelidæ, Carabidæ, and Coccinellidæ of the Leconte collection of Coleoptera.

Numerous additions to the biological collections of Lepidoptera and Coleoptera have been incorporated; some parts of these have been rearranged.

Long exposure in alcohol has rendered some of the labels almost illegible. Prof. C. L. Jackson kindly made some experiments to restore these; he finds that by gently washing them with yellow ammonic sulphide the legend, though not permanently restored, is made plain enough to be copied before it fades.

The selection of the series for the African Faunal Room progresses but slowly, owing to a lack of material and the difficulty of its determination.

A series of galls for the botanical section of the University Museum awaits the receipt of the exhibition boxes.

REPORT ON THE INVERTEBRATA (EXCLUSIVE OF INSECTS).

By Walter Faxon.

There have been received, through exchange with the United States National Museum, a collection of 39 species (119 specimens) of Crustacea, 17 species (33 specimens) of Sponges, and a duplicate set of the Holothurians secured during the "Albatross" Expedition of 1891. The Peabody Academy of Science has presented the Museum with 22 species (45 specimens) of Crustacea, including Cymothoids determined by Schiödte and Meinert. To Mr. C. E. Hoyle the Museum is indebted for a small but choice collection of land snails from Jamaica and 39 specimens of land crabs (*Cœnobita diogenes*) brought to Cambridge alive from Jamaica; to Dr. R. T. Jackson for a small miscellaneous lot of marine Invertebrata from Eastport, Me.; to Professor S. E. Meek for 3 species (16 specimens) of Crayfishes from Arkansas and Texas, including the rare *Cambarus lancifer;* to D. F. Turnbull for a specimen of *Panulirus guttatus* from the Barbados; to Professor H. L. Osborn for specimens of Crayfishes from Fort Snelling, Minn. A small supplementary collection of Japanese Crustacea has been got by purchase. The Pycnogonida and Copepoda of the "Albatross" Expedition of 1891 have been returned by Messrs. Schimkéwitsch and Giesbrecht, to be divided between this Museum and the United States National Museum. An interesting Sponge from New Guinea has been presented by Mr. Appleton Sturgis. The Foraminifera sent to Dr. Goës for examination have been returned by him. Material has been sent out, as gift or exchange, to the United States National Museum, the Boston Society of Natural History, the British Museum, and Mr. A. F. Foerste.

A short paper on the Development of Dicranodromia has been published by E. Caustier in the Comptes Rendus for 1895, p. 573, based upon material collected by the "Blake." A number of Memoirs have been issued in the Museum publications (see Appendix A) based upon the collections of this department connected with the explorations of the "Albatross" and the "Wild Duck." I have myself completed the Report on the Stalk-eyed Crustacea of the "Albatross" Expedition of 1891, which has been issued as Vol. XVIII. of the Memoirs, 292 pp., 67 Pl. I have also published the following ornithological notes in the "Auk" for 1895 (Vol. XII.): —

The Philadelphia Vireo in Cambridge, Mass.

The Rough-winged Swallow breeding in North Adams, Berkshire County, Mass.

Bicknell's Thrush and the Prairie Horned Lark as Summer Residents of Berkshire County, Mass.

The work on the Museum collections has been carried on along the lines indicated in my last annual report.

REPORT ON THE DEPARTMENT OF VERTEBRATE PALÆONTOLOGY.

By Charles R. Eastman.

The period embraced by the following report dates from the 1st of January of the present year, when the Assistant was appointed. Owing to the absence of a special custodian for this Department, it has only been possible for a number of years past to store the numerous accessions to the collection in trays, in practically the same condition in which the material was received, — sometimes, indeed, without removing it from the original wrappers. It was therefore necessary thoroughly to overhaul, clean, rearrange, and distribute the contents of each tray in the collection according to the families and genera represented. Up to the present time a number of the individual collections (such as the Enniskillen, Stock, Haeberlein, and Damon collections, etc.) had been kept intact, one label on the outside of the tray serving to indicate the source and general nature of the contents. These collections were left undisturbed until the general arrangement was completed, when they too were broken up and the material distributed. In all cases where the specimens were unmarked, care was taken to provide new labels specifying the locality and name of the original collection. No time was spent, however, in determining unidentified specimens beyond families or genera, one label on the outside of the tray sufficing as before to indicate the name of the family or genus, and the geological horizon. Neither was any attempt made to care for broken or oxidized specimens. But during the coming year it is proposed to go through the whole collection again, labelling and repairing all specimens in need of attention. Pains will also be taken to select such materials as may be deemed suitable to be placed on exhibition. With the material now on hand, it will be possible to fill up the Mesozoic Exhibition Room in such manner as shall make it fully as interesting and instructive to the general public as the much frequented

Tertiary and Quaternary Exhibition Rooms. The faunal series of the two latter rooms can be still further supplemented by the mounting of several nearly perfect skeletons.

The size of the collection is considerable, filling nearly 1,500 trays. More detailed lists have been made out in two series for the use of the Department; one showing the faunal series comprised by the collection, arranged stratigraphically; and the other showing the extent to which the smaller zoölogical subdivisions are represented. No record has been kept of the size of the various individual collections, but it may be stated that the bulk of the fossil Reptiles and Mammals are contained in the Garman and Sternberg collections; and the fossil Fishes in the same, together with the Enniskillen, Stock, and Haeberlein collections. The last two comprise about 60 trays each, or upwards of 3,000 specimens. Much of the material is of great interest, and wholly undescribed.

The collection as a whole may be considered as a very representative one. Parts of it could well be increased, especially in certain orders of Mammals. Other parts are not only extremely rich (as, for instance, the Palæozoic Fishes, Cretaceous Reptiles, the Proboscidea, etc.), but contain a large number of duplicates, by means of which a profitable exchange may be carried on in the course of time. The older portions of the collection, and most particularly the collection of fossil Fishes, have a very great historic interest. The number of type specimens is quite large, and they are exceedingly valuable. A few of Professor Agassiz's types are preserved in the Old Collection, presented to the Museum in 1859. The Bronn, Boucault, de Koninck, Enniskillen, Geinitz, and above all the Schultze Collections, contain specimens of extraordinary interest. A list is appended, for convenience of reference, which is intended to include the name and date of reception of all the more important individual collections that have been added to this department since the Museum was founded. Further information in regard to them is preserved in the records of the Department; and scattered notes, together with lists of minor accessions, may also be found in back numbers of the Annual Reports of the Museum. References to the more important of these reports, and to a few additional sources of information, are given in the subjoined index.

According to the Annual Report of 1870 the fossil Vertebrates then belonging to the Museum were numbered and catalogued by

Dr. G. A. Maack, who was the Assistant at the time. Unfortunately this catalogue was not found among the effects left by Dr. Maack, and only a few sheets are extant. This is the more to be regretted, since in many cases, where numbers take the place of separate labels, the catalogue furnishes the only information we have as to the locality, collector, and history of the older specimens in the collection. In conclusion, it may be said that there are ample materials in the collection to serve as a basis for a number of interesting publications.

Additions to the Collection made during the Year.

Clidastes tortor Cope. Niobrara; Western Kansas. A small mounted specimen purchased of the collector, Mr. Charles H. Sternberg. Received Jan. 10, 1895. Also a fairly complete skeleton of a fossil Peccary, and a Pteranodon skull.

Pareiosaurus Baini Seeley. Karoo Formation [Trias]; South Africa. Cast of the original in the British Museum. Purchased.

Compsognathus longipes Wagner. Lithographic slates; Solenhofen, Bavaria. Cast of the unique specimen preserved in the Munich Museum.

Casts of Aëtosaurus and of Dodo from the Oxford Museum.

Papers published during the Year.

History of Instruction in Geology and Palæontology in German Universities. Translated from the German of Professor K. A. von Zittel. [Amer. Geol., Vol. XIV. pp. 179–185.]

Beiträge zur Kenntniss der Gattung Oxyrhina, mit besonderer Berücksichtigung von Oxyrhina Mantelli, Agassiz. [Palæontographica, Bd. XLI. pp. 141–191.]

Elements of Palæontology. Translated and edited from the German of Professor K. A. von Zittel. Vol. I., Part I. Protozoa to Mollusca. (In press.)

References to the principal Published Documents relating to the Department of Vertebrate Palæontology.

Annual Reports of the Museum of Comparative Zoölogy, 1859 to 1895. In particular, the Reports on the Palæontological Department for the years 1869 to 1874, beginning with the following pages: 1869, p. 44; 1870, p. 30; 1871, p. 29; 1872, p. 18; 1873, p. 34; 1874, p. 20.

Naturhistorische Museen in Nord-America. Von K. A. von Zittel. [Beilage zur Allgemeine Zeitung, No. 349, Dec. 16, 1883.]

Preliminary Account of the Fossil Mammals from the White River Formation contained in the Museum of Comparative Zoölogy. By W. B. Scott and H. F. Osborn. [Bull. M. C. Z., Vol. XIII., Sept., 1887.]

Preliminary Account of the Fossil Mammals from the Loup Fork Formation. Part II. Carnivora and Artiodactyla, by W. B. Scott. Perissodactyla, by H. F. Osborn. [Bull. M C. Z., Vol. XX., 1890.]

Vertebrate Palæontology in some American and Canadian Museums. By A. Smith Woodward. [Geol. Mag., Dec. III., Vol. VII., 1890.]

List of the Principal Collections of Vertebrate Fossils Belonging to the Museum.

1852. Old Collection. Purchased by private subscription from Professor Agassiz.

1859. Professor Agassiz Collection. Presented. Contains a number of valuable types.

1859. Boucault Collection. Purchased. Gray Fund.

1859. Bronn Collection. A rich collection of German Mesozoic Fossils, for the most part determined by Professor Bronn. Purchased.

1859. Duval Collection. Chiefly Fishes and Mammals from the Mesozoic and Cenozoic of France. Purchased. Gray Fund.

1861. Campiche Collection. Purchased. Gray Fund.

1861. De Koninck Collection. Purchased. The entire collection of L. G. de Koninck.

1861. Enniskillen Collection. First instalment received by exchange.

1862. Enniskillen Collection. Second instalment purchased.

1862. Imhoff Collection. Contains chiefly Invertebrates. Purchased.

1865. Gastaldi Collection. Exchange.

1865. Michellotti and Rigacci Collection. Exchange.

1866. Leonard Collection. Fossil Footprints, Connecticut Valley. Presented.

1868. Haast Collection. Four species of *Dinornis* from New Zealand. Exchange.

1869. Shaler and Barnard Collection. Pleistocene Mammals, chiefly Bison and Mastodon remains, from Big Bone Lick, Ky. Presented.

1870. Professor Agassiz Collection. Fossil Fishes from the Connecticut Valley.

1870. Allen Collection. Green River Fishes. Collected by J. A. Allen.

1870. Lesquereux Collection. Mostly fossil plants, but containing some fish and amphibian remains from the American Coal Measures. Purchased.

1871. Lartet Collection. Fossil Mammals from France. Presented.

1871. Quimby Collection. A large series of fossil Vertebrates from the Red Crag of England.

1871. Schultze Collection. An exceedingly valuable collection of Devonian fossils, chiefly from the Eifel District. Purchased of Dr. L. S. Schultze.

1871. St. John Collection. Fossil Fishes from the Sub-Carboniferous of Indiana, Iowa, Illinois, and Missouri.

1871. Von Cotta Collection. Fossil Fishes from the Harz Mountains and Bohemia. Presented.

The collections obtained from 1875 to the present time were purchased by Mr. Agassiz.

1875. Boylston Hall Collection. Mastodon remains. Deposited by Harvard College.

1875. Sladen Collection. A small but interesting series of English Carboniferous Fishes. Exchange with W. Percy Sladen, Esq.

1878. A collection of casts purchased from H. A. Ward.

1879. Dyer Collection. A very large collection, but consisting chiefly of Invertebrates, from the Cincinnati Group. Purchased.

1879. Gebbard Collection. Walcott Collection. Contain mostly Invertebrates. Purchased.

1880. Bird Collection. Chiefly Invertebrates, but some Fishes, from the Cretaceous of Mt. Lebanon. Purchased of Rev. Wm. Bird.

1880. First Garman Collection. Vertebrates from the Bad Lands. Purchased.

1881. Second Garman Collection. Vertebrates from the Bad Lands. Purchased.

1881. Day Collection. Mostly Invertebrates from the Niagara Limestone of Wisconsin. Collected by Rev. F. H. Day. Purchased.

1881. First Sternberg Collection. Vertebrates from the Cretaceous of Western Kansas. Purchased.

1881. Taylor Collection. Mostly Invertebrates from the Silurian of New York. Purchased of Prof. G. W. Taylor.

1882. Third Garman Collection. Vertebrates from the Western States. Purchased.

1882. Second Sternberg Collection. Vertebrates from the Permian of Texas. Purchased.

1882. Damon Collection. Fossil Fishes from the Devonian of Scotland, Carboniferous Limestone of Ireland, and Cretaceous of Mt. Lebanon. Purchased.

1882. Haeberlein Collection. A magnificent collection of Vertebrate and Invertebrate fossils from the Lithographic Slates of Solenhofen and Kelheim, Bavaria. First instalment received in 1882; second in March, 1883. Purchased of Ernst Haeberlein, of Pappenheim, Bavaria.

1882. Schary Collection. An unrivalled collection of Palæozoic fossils, almost entirely Invertebrates, from Bohemia. Purchased from the heirs of J. M. von Schary.

1882. Tracy Collection. Fishes, Reptiles, and Invertebrates from the Cambridge Greensand. Purchased.

1883. Fearon Collection. Fossil Fishes from the Coal Measures of East Liverpool, Ohio. Purchased from R. N. Fearon.

1883. Fourth Garman Collection. Jurassic Reptiles and Tertiary Mammals from the Western States. Purchased.

1883. Stock Collection. Fossil Fishes and Amphibians from the Carboniferous of Scotland; a large and extremely interesting collection. Purchased of Thomas Stock, Esq., Edinburgh. First instalment received in November, 1883; second, in March, 1884.

1884. Fifth Garman Collection. Fossil Vertebrates from Kansas, Nebraska, Dakota, and Wyoming, including the secondary collections made by H. C. Clifford, G. R. Allaman, and L. Hollywood. Purchased.

1885. Casts of fossil Vertebrates described by Professor O. C. Marsh. Purchased.

1885. Terrell Collection. Fossil Fishes from the Huron Shales [Upper Devonian] of Lorraine County, Ohio. Collected by J. Terrell, Esq., of Oberlin, O., and described in part by Prof. J. S. Newberry. Purchased.

1886. Rossignol Collection. A small but valuable collection of fossil Mammals from the Phosphorites of France. Purchased.

1886. Eyerman Collection. A series of fossil Footprints from the Trias of New Jersey and Eastern Pennsylvania. Purchased of J. A. Eyerman.

1889. Fritsch Collection. A complete set of Stegocephalan casts from the Gaskohle of Bohemia. Purchased of Professor Anton Fritsch.

1889. Ward Collection. Five mounted skeletons of Mammals from the Pampas Formation of Argentina, forming the finest exhibit of fossil Vertebrates in the Museum. Purchased of Prof. H. A. Ward.

1890. Springer Collection. A small but valuable collection of Cretaceous fossils from New Mexico. Presented.

1894. Cast of *Iguanodon Bernissartensis* Boulenger. Purchased.

A number of smaller collections, together with some whose date of instalment is uncertain, are not enumerated in the above list. Mention should be made of the following, however, which were received previous to 1869, and were secured by purchase, exchange, or donation: Carl Meyer, Eichwald, Hoernes, Michelotti, Bellardi, Appelius, Rigacci, Roualt, Tarbé, Krantz, Geinitz, and Lyell Collections. (See Annual Report for 1869, p. 32.)

REPORT ON THE FOSSIL INVERTEBRATES.

By Alpheus Hyatt.

The systematic collection of Cephalopoda has been greatly enlarged. The Assistant has picked out, labelled, and placed on exhibition a large number of appropriate fossils. He has also revised the collections of Pectenidæ and Monotidæ, describing many genera and species in preparation for a monograph of these groups. This work has been finished throughout Palæozoic and Mesozoic time, inclusive of the Jura.

The department is indebted to Dr. R. T. Jackson for a large amount of work in labelling and arranging and otherwise improving the condition of the collections, especially the fossil Corals, Echinoderms, and Cephalopods.

Dr. E. C. Beecher has presented to the Museum one of his valuable preparations of Trinucleus concentricus, showing the eyes as recently described by him, and also some beautiful silicious fossils from the Trenton Limestone etched out in relief with the aid of acid.

Thanks are due also to Mrs. W. D. Boardman for a fine series of extremely large and interesting Hippurites from Gosau, Austria.

Several desirable specimens of Eurypteri have been received from Mr. Roswell Johnson of Buffalo, and also a number of fine specimens of carboniferous and cretaceous Crinoids have been obtained by exchange with Professor Ward of Rochester.

The following papers have been published: —

"Remarks on the Genus Nanno, Clarke," by Alpheus Hyatt. American Geologist, Vol. XVI., July, 1895, pp. 12, 1 Plate.

"Terminology proposed for Description of the Shell in Pelecypoda," by same. Proc. Amer. Assoc., 1895. Abstract in Am. Geol., Vol. XVI. No. 4, pp. 252–254.

REPORT ON THE LIBRARY.

By Miss F. M. Slack.

During the year ending September 1, 1895, the Library has received 569 volumes, 1,937 parts, and 132 pamphlets.

	VOLUMES.	PARTS.	PAMPHLETS.
Gift	13	69	12
Exchange	163	771	85
Purchase	27	264	0
A. Agassiz	79	819	35
Binding Parts	287	0	0
Whitney Library	0	14	0
	569	1,937	132

The number of volumes now in the Library (exclusive of pamphlets and the Whitney Library) is 22,171. There are 15,637 pamphlets bound in 2,649 volumes, making the total number of volumes 24,820.

[A]

PUBLICATIONS
OF THE
MUSEUM OF COMPARATIVE ZOÖLOGY
FOR THE ACADEMIC YEAR 1894–95.

Of the Bulletin: —

Vol. XVI. (Geological Series, Vol. II.)

No. 15. Notes on the GEOLOGY of the Island of CUBA, based on a Reconnoissance made for ALEXANDER AGASSIZ. By R. T. HILL. pp. 45. 9 plates. April, 1895.

[Vol. XVI. *is complete.*]

Vol. XXV.

No. 8. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "ALBATROSS." XIV. The Pelagic SCHIZOPODA. By A. ORTMANN. pp. 14. 1 Plate. September, 1894.

No. 9. Cruise of the Steam Yacht "WILD DUCK" in the BAHAMAS, January to April, 1893, in Charge of ALEXANDER AGASSIZ. II. Notes on the SHELLS collected. By W. H. DALL. pp. 12. 1 Plate. October, 1894.

No. 10. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "ALBATROSS." XIII. Die OPISTHOBRANCHIEN. Von R. BERGH. pp. 110. 12 Plates. October, 1894.

No. 11. Cruise of the Steam Yacht "WILD DUCK" in the BAHAMAS, January to April, 1893, in Charge of ALEXANDER AGASSIZ. III. An Account of some MEDUSÆ obtained in the Bahamas. By A. G. MAYER. pp. 8. 3 Plates. November, 1894.

No. 12. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "ALBATROSS." XVI. Die Pelagischen COPEPODEN. Von W. GIESBRECHT. pp. 22. 4 Plates. April, 1895.

[Vol. XXV. *completed.*]

Vol. XXVI. (December, 1894–April, 1895. *Complete.*)

No. 1. A Reconnoissance of the BAHAMAS and of the ELEVATED REEFS of CUBA in the Steam Yacht "WILD DUCK," January to April, 1893. By A. AGASSIZ. pp. 204. 47 Plates. December, 1894.

No. 2. A Visit to the BERMUDAS in March, 1894. By A. AGASSIZ. pp. 78. 30 Plates. April, 1895.

Vol. XXVII.

No. 1. SPERMATOGENESIS of CALOPTENUS femur-rubrum and CICADA tibicen. By E. V. WILCOX. pp. 34. 5 Plates. May, 1895.

No. 2. On the Early DEVELOPMENT of LIMAX. By C. A. KOFOID. pp. 86. 8 Plates. August, 1895.

No. 3. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "ALBATROSS." XVII. BIRDS from Cocos and MALPELO ISLANDS, with Notes on PETRELS obtained at Sea. By C. H. TOWNSEND. pp. 8. 2 colored Plates. July, 1895.

No. 4. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "ALBATROSS." XVIII. Die COMATULIDEN. Von C. HARTLAUB. pp. 24. 4 Plates. August, 1895.

[Vol. XXVII. *to be continued.*]

Vol. XXVIII. (Geological Series, Vol. III.)

No. 1. FOSSIL SPONGES of the Flint Nodules in the LOWER CRETACEOUS of TEXAS. By J. A. MERRILL. pp. 26. 1 Plate. July, 1895.

[Vol. XXVIII. *to be continued.*]

Of the Memoirs: —

Vol. XVII.

No. 3. Reports on an EXPLORATION off the WEST COASTS of MEXICO, CENTRAL and SOUTH AMERICA and off the GALAPAGOS ISLANDS, in Charge of ALEXANDER AGASSIZ, by the U. S. Fish Commission Steamer "ALBATROSS," etc. XII. The HOLOTHURIOIDEA. By H. LUDWIG. pp. 183. 19 Plates. October, 1894.

[Vol. XVII. *is completed.*]

Vol. XVIII. contains: —

Reports on an EXPLORATION off the WEST COASTS of MEXICO, CENTRAL and SOUTH AMERICA, and off the GALAPAGOS ISLANDS, in Charge of ALEXANDER AGASSIZ, by the U. S. Fish Commisson Steamer "ALBATROSS," etc. XV. The CRUSTACEA. By WALTER FAXON. pp. 292. 67 Plates, 1 Chart. April, 1895.

Vol. XIX.

No. 1. The CYPRINODONTS. By S. GARMAN. pp. 180. 12 Plates. July, 1895.

[Vol. XIX. *to be continued.*]

[B]

THE Faculty of the Museum of Comparative Zoölogy will receive applications from candidates desiring to occupy the table at the Naples Zoölogical Station, which has been placed at its disposal from October 1, 1895.

The applicant must be (or have been recently) a student or instructor at some American University, preferably a person who has taken the degree of Ph. D. or S. D.; he must have published some creditable original investigation, and should be recommended as an able investigator by the Professor under whom he has studied.

Applicants will please forward to the undersigned their recommendations, and a statement of their qualifications, and of the subject to which they hope to devote themselves.

In order that the Faculty may make the most satisfactory disposition of the table during the whole year, the applicants are requested to state the length of time they desire to remain at Naples, and also the earliest and latest dates within which they can avail themselves of the appointment.

The Faculty will, at suitable intervals, nominate to the Corporation of Harvard College for approval the incumbent or incumbents for the year 1895–96.

ALEXANDER AGASSIZ,
Director.

[C]

INVESTED FUNDS OF THE MUSEUM.

IN THE HANDS OF THE TREASURER OF HARVARD COLLEGE, SEPT. 1, 1894.

Sturgis-Hooper Fund	$100,000.00
Gray Fund	50,000.00
Agassiz Memorial Fund	297,933.10
Teachers and Pupils Fund	7,594.01
Permanent Fund	117,469.34
Humbolt Fund	7,740.66
Virginia Barret Gibbs Fund	5,000.00
	$585,737.11

The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Curator. The accounts are annually examined by a committee of the Overseers. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts with vouchers to the payment of which the income is applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Virginia Barret Gibbs Scholarship Fund, of the value of $250, is assigned annually, with the approval of the Faculty of the Museum, at the recommendation of the Professors of Zoölogy and of Comparative Anatomy in Harvard University, "in supporting or assisting to support one or more students who have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy."

The income of the Humboldt Fund (about $400) can be applied for the benefit of one or more students of Natural History, either at the Museum, the Newport Marine Laboratory, the United States Fish Commission Station at Wood's Hole, or elsewhere.

Applications for the tables reserved for advanced Students at the Newport Marine Laboratory, and for the tables at the Wood's Hole Station, should be made to the Director of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

See Appendix B of this Report for the conditions upon which the table at the Naples Zoölogical Station is assigned.

[D]

CONTRIBUTIONS TO THE ORNITHOLOGICAL COLLECTION MOUNTED BY W. E. D. SCOTT.

O. Ames 2d	$100
Charles C. Beaman	100
W. S. Bigelow	100
W. L. Bryant	100
Walter G. Chase	300
W. H. Forbes	50
L. C. Fenno	50
Geo. A. Goddard	50
Joel Goldthwait	500
A. Hemenway	50
J. J. Higginson	50
R. C. Hooper	50
A. A. Lawrence	50
Samuel C. Lawrence	50
Augustus Lowell	100
Wm. Minot	$100
Geo. Mixter	100
H. Milliken	100
Richard Morgan	10
Geo. A. Nickerson	50
A. B. Otis	10
Dr. E. D. Peters, Jr.	50
Dudley L. Pickman	100
Mrs. W. D. Pickman	100
S. D. Warren	25
Chas. G. Weld	100
S. M. Weld	50
A friend	25
A friend	10
A friend	10

[E]

For and in consideration of one dollar to me in hand paid, and other good and valuable considerations, the receipt of which is hereby acknowledged, I have this day sold and conveyed to Alexander Agassiz, Esq., of Cambridge, Massachusetts, all the skins and mounted birds collected by me, and now in four cases in the Museum building, being in the aggregate about three thousand (3,000) specimens in all, and being the residue of birds collected by me; the last and highest catalogue number in my catalogue being No. 13,105. This bill of sale embraces all birds collected by me or in my collection on this first day of April, 1895, and remaining undisposed of at that date, and more particularly described in my catalogue below the number 13,105.

W. E. D. SCOTT.

In the presence of
WALTER FAXON.

April 1, 1895.

Mus. 120.20.6.1

With the Compliments of
ALEXANDER AGASSIZ.

ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE,

FOR

1895-96.

CAMBRIDGE, U.S.A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1896.

Case [illegible] Shelf

LIBRARY
OF THE
Peabody Museum of American Archaeology and Ethnology
IN CONNECTION WITH HARVARD UNIVERSITY.

PRESENTED BY
[illegible]

Received Jan. 3, 1876

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ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE,

FOR

1895-96.

RECEIVED,
DEC 31 1896
PEABODY MUSEUM.

CAMBRIDGE, U.S.A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1896.

Mus.120.20.6.1
Gift of
A. Agassiz
Rec. Dec. 31, 1896

FACULTY OF THE MUSEUM.

Faculty.

CHARLES W. ELIOT, *President.*
ALEXANDER AGASSIZ, *Curator.* GEORGE L. GOODALE.
——— ———, *Secretary.* HENRY P. WALCOTT.

Officers.

ALEXANDER AGASSIZ	*Director and Curator.*
——— ———,	*Sturgis-Hooper Professor of Geology.*
NATHANIEL S. SHALER	*Professor of Geology.*
E. L. MARK	*Hersey Professor of Anatomy.*
WILLIAM MORRIS DAVIS	*Professor of Physical Geography.*
H. L. SMYTH	*Assistant Professor of Mining.*

Appointed by the Faculty of the Museum.

WALTER FAXON	*Assistant in Charge.*
SAMUEL GARMAN	*Assistant in Herpetology and Ichthyology*
WILLIAM BREWSTER	*Assistant in Ornithology and Mammalogy.*
ALPHEUS HYATT	*Assistant in Palæontology.*
SAMUEL HENSHAW	*Assistant in Entomology.*
W. McM. WOODWORTH	*Assistant in Charge of Vermes.*
ALFRED G. MAYER	*Assistant in Charge of Radiates.*
C. R. EASTMAN	*Assistant in Vertebrate Palæontology.*
MISS F. M. SLACK	*Librarian.*
MAGNUS WESTERGREN	*Artist.*

Appointed by the President and Fellows.

ROBERT TRACY JACKSON	*Instructor in Palæontology.*
J. B. WOODWORTH	*Instructor in Geology.*
G. H. PARKER	*Instructor in Zoölogy.*
W. McM. WOODWORTH	*Instructor in Microscopic Anatomy.*
T. A. JAGGAR, Jr.	*Instructor in Geology.*
C. B. DAVENPORT	*Instructor in Zoölogy.*
ROBERT DeCOURCEY WARD	*Instructor in Climatology.*
HENRY R. LINVILLE	*Assistant in the Zoölogical Laboratories.*
JOHN T. HAMAKER	*Assistant in the Zoölogical Laboratories.*
J. H. HATHAWAY	*Assistant in the Zoölogical Laboratories.*
VERNON F. MARSTERS	*Assistant in Physical Geography.*
J. E. WOODMAN	*Assistant in Geology.*
GEORGE C. CURTIS	*Assistant in the Geographical Laboratory.*
R. J. FORSYTHE	*Assistant in Metallurgy.*

REPORT.

To the President and Fellows of Harvard College: —

During the past year the usual courses of instruction have been given at the Museum in the Natural History Laboratories. Those in Zoölogy were given by Professor Mark, Doctors Davenport, Woodworth, and Parker, and Mr. H. V. Neal, assisted in the Laboratory work by Messrs. H. R. Linville, H. S. Jennings, J. T. Hamaker, J. M. Parker, W. L. Tower, A. Rose, A. S. Hanna, R. W. Hall, and B. S. Oppenheimer.

Professors Whitney, Shaler, Davis, and Wolff gave courses of instruction in Geology, Palæontology, Physical Geography, Meteorology, and Petrography. The Assistants in these Departments were Messrs. Robert Tracy Jackson, J. B. Woodworth, R. DeCourcey Ward, Leon S. Griswold, R. A. Daly, C. L. Whittle, F. C. Schrader, and T. A. Jaggar, Jr. The courses in Mining Geology and allied subjects were given by Prof. H. L. Smyth.

For the details of these courses of instruction, as well as of the summer courses in Geology, I would refer to the accompanying special reports of the Professors and Instructors.

The Newport Marine Laboratory has, as usual, been open to advanced students in Zoölogy. Eight students spent a part of their time in the Laboratory collecting material for their special investigations, which they will continue and prepare for publication in Professor Mark's Laboratory at the Museum. From want of funds and for other reasons the Museum Table at the Naples Zoölogical Station has been given up.

We have to thank Commander Brice, United States Fish Commissioner, for the facilities granted to our students in connection with their work at the Fish Commission Station at Wood's Hole.

The income of the Virginia Barret Gibbs Scholarship was used according to the terms of the gift.

The Faculty of the Museum nominated, as occupants of the Naples Table for parts of the year 1895–96, Dr. R. G. Harrison and Dr. A. W. Weysse.

We are indebted to Professor Hyatt for the care he has given to the collection of Invertebrate Fossils under his charge. Mr. R. T. Jackson has kindly undertaken the selection of a collection of Palæozoic fossil invertebrates to be placed on exhibition during the coming year in the room reserved for the Palæozoic faunæ.

The Exhibition Room devoted to Jurassic and Cretaceous faunal collections has during the past year been opened to the public. The central piece of the room is the mounted cast of Iguanodon obtained from the Brussels Museum. A number of fossil Reptiles, as well as of casts of limbs of the larger Western Dinosaurians have also been placed in this room. In the Mesozoic, as well as in the rooms devoted to Tertiary faunal collections, no attempt has as yet been made to place on exhibition a selected collection of Invertebrates. This we hope to do as soon as the Palæozoic faunal collections have been placed on exhibition. The cases of this room are nearly ready for the specimens, and we hope before the next academic year to open this room to the public. As the Museum collections are specially rich in Palæozoic fossils, it should be possible to make an interesting general exhibit of the older faunæ of the world.

Among the collections of fossils received, I may mention a large collection presented by the late Professor Whitney. These collections were principally made by him during his connection with the Geological Survey of California.

The fossil Vertebrates have been in charge of Dr. C. R. Eastman, who has made excellent progress in arranging and storing our material. Dr. Eastman has also secured for the Museum a number of interesting fossil Fishes.

The Europæo-Siberian Room has been rearranged. Several new cases have been added, and a large amount of material has been placed on exhibition, mainly Birds and Mammals. Mr. Brewster has, as in former years, kindly supervised the care of the collection of Birds and Mammals. The Museum is also indebted to him for much valuable assistance in other directions.

Professor Faxon has devoted the greater part of his time to the revision of the collection of Mollusks. This work is now nearly completed, and it will leave the collection quite accessible to specialists. But until the Museum can afford to employ a conchologist whose whole time will be devoted to the care of his department we can hardly hope to do more than maintain in good condition the conchological collections we now possess, and cannot of course expect to carry out any important original work in a group in which so many of the older American naturalists have attained prominence. Mr. Faxon has devoted considerable time to a careful revision of the collections of Deep-Sea Crustacea, and has succeeded in placing this material in excellent condition for consultation.

The collections of Fishes and Reptiles in charge of Mr. Garman continue in excellent condition.

In the Entomological Department Mr. Henshaw reports that a good deal of his time has been spent in answering requests made upon him for information. He has continued to send out material for examination, while much of his time has also been given to the care of a number of small collections sent to the Museum, and to the supervision of the collections in general.

Dr. W. McM. Woodworth has continued in charge of the collections of Worms, but owing to his absence in Australia for a great part of the past Academic year few additions have been made to the collections in his charge.

The Library has received by gift or purchase the usual number of accessions, and our exchanges have increased somewhat. The number of volumes in the Library is now more than twenty-five thousand, and inclusive of the Whitney Library over thirty thousand. The Library has received from the State Department a set of the Proceedings of the Fur Seal Arbitration. In connection with Library matters, I may call attention to the plan proposed by Professor Davis, of concentrating at the Museum Library more of the Geological material now in the general Library, and of placing in Gore Hall the Geographical collections in the Museum Library. This is merely extending the plans already in existence of splitting up our Library as far as practicable into smaller collections, more readily accessible to workers in special departments. We thus have at the Museum, independent of the general Library, smaller collections devoted to Entomology, to Marine Invertebrates and Thalassography, to Fishes and Reptiles, and the Assistants always keep within reach the most important systematic works in their Departments. It is thus a comparatively simple task for them to keep track of the bibliography of their respective Departments.

A list of the publications of the Officers and Instructors of the Museum, other than those contained in our Memoirs and Bulletins, will be found accompanying the special reports.

For a complete List of the Publications of the Museum during the past year I refer to Appendix A. The publications have been limited to the completion of Volume XXVII., and to the publication of Volume XXIX. of the Bulletin. The Corporation has continued the allowance of $400 made the previous year to aid in the publication of some of the contributions from the Zoölogical Laboratory. We have this year made the first attempt at joint publication with the Boston Society of Natural History of some of the papers which, while presented to the Society, have yet been worked out at the Zoölogical Laboratory of the Museum in charge of Professor Mark. The American Academy, the Boston Society of Natural History, and the Museum having agreed upon a uniform type and size for their octavo publications, it may hereafter be possible to publish at joint expense illustrated papers which could not otherwise be published.

Of the "Albatross" Expedition of 1891 two Bulletins have been published during the past year, Dr. Müller's Report on the Ostracods, and that of Dr. Goës on the Foraminifera.

Excellent progress has been made with the Monograph of Professors Milne-Edwards and Bouvier on the Galathoidæ of the "Blake," so that we hope to issue it during the early part of the year.

The Report of Professor G. Brown Goode and Dr. Tarleton H. Bean on the Deep-Sea Fishes of the "Blake" has been issued as a special Bulletin by the National Museum and the Smithsonian Institution. By agreement with Professor Goode the Report on the collections of the "Blake" was incorporated with that on the collection of Fishes made by the "Fish Hawk" and "Albatross" along the east coast of the United States and in the Caribbean Sea. The Museum has issued as Volume XXII. of the Memoirs this joint publication of Goode and Bean on Oceanic Ichthyology.

The pressure of other work prevented the late Professor Goode from carrying out his plans regarding a discussion of the geographical and bathymetrical distribution of Deep-Sea Fishes in the publication just completed. It is hoped that this important work may yet be undertaken by other investigators working in this field.

Good progress has been made on the text and plates of Mr. Garman's Report on the Deep-Sea Fishes of the "Albatross" Expedition of 1891. More than 40 Plates have been finished by Mr. Westergren.

Dr. Chun, to whom a collection of Deep-Sea Crustacea of the "Albatross" had been sent, has published a Preliminary Report on the theory of vision at great depths in the sea, based upon his study of the organs of vision of that group. See Bibliotheca Zoologica, Heft XIX. Lief. 4.

Among the specimens purchased for the Museum I may mention a small collection of European Mammals and Birds, an African Rhinoceros, a Zebra, a number of casts of rare vertebrate fossils, a collection of Pteropods, and one of West Indian Strophias.

Among the collections presented to the Museum the following are specially to be noted: a type collection of more than two hundred species of Corbiculæ, received from Mr. Temple Prime; the first instalment of a valuable collection of New England Shells, from Messrs. Smith and Clapp; from the Smithsonian Institution we have received a collection of Deep-Sea Fishes from the Northern Pacific and Behring Sea, made by the "Albatross," and a collection of Fishes, made under the auspices of the United States Fish Commission, from various parts of the southeast coast of the United States; from Mr. F. W. Townsend, a collection of Shells from the Persian Gulf; and a number of Foraminifera from Mr. D. Bryce Scott.

Collections have been sent for study to Mr. S. F. Conant; to Mr. Charles Schuchert of the National Museum have been intrusted a number of specimens of Palæozoic Starfishes; to Messrs. Wachsmuth and Springer, a few Crinoids. Exchanges have been made with the Museum at Santiago, Chile, and the State College of Kentucky. The Crustacea collected by the "Albatross" expedition of 1891 have been returned to the National Museum, on behalf of the United States Fish Commission.

The Monograph of Messrs. Wachsmuth and Springer on the North American Crinoidea Camerata is approaching completion. The whole edition of the 83 Plates which are to accompany the Monograph has been delivered. Mr. Springer, into whose hands has fallen the completion of the text, hopes the volumes may be issued by the end of this year. The senior author of the work, Mr. Charles Wachsmuth, has not lived to see the publication completed. His whole life had been devoted to the study of the North American Crinoids. He was an ardent collector and a philosophical student of the group. He made during his lifetime two great collections, one of which was secured for the Museum in 1873, and the other he brought together with his friend Mr. Springer. These collections were the materials upon which was based their Monograph, which will be his monument to science.

A good deal of confusion regarding the date of publication of this Monograph has been caused by the premature publication, a few months ago, of a review of the volumes by a person having access to the sheets and plates in Mr. Wachsmuth's hands.

It is hoped that by the arrangements made by the Corporation on behalf of the Museum, the funds which for the past years have been expended for the benefit of the Undergraduate Department may gradually be restored to the Museum account, and expended more in accordance with the original aims of the Museum.

During the past year the Museum has lost the services of two of its officers.

Dr. D. D. Slade, who for many years had devoted his time to the Osteological Collection of the Museum, died at Chestnut Hill in February last. Dr. Slade attempted to build up an advance course of osteological research, and it was a great disappointment to him that he met with so little encouragement. He devoted his time mainly to the arrangement of the material in his charge, and wrote a number of papers on special subjects connected with osteology. He hoped to build up the osteological collection with special reference to its use as an aid in palæontological research.

By the death of Josiah D. Whitney, American geology loses one of its oldest Professors and one of its soundest and most thorough investigators. He was the oldest officer of the Museum. In 1875, when the Sturgis-Hooper Professorship was changed to one of Geology, and his duties as Director of the Mining School ceased, Professor Whitney became attached to the Museum. From that time he was identified with its interests, devoting his time mainly to higher instruction and to the publication of the material he had accumulated during his connection with various geological surveys.

Of the more important publications which the Museum owes to him, I may mention "The Azoic System," "The Auriferous

Gravels of the Sierra Nevada of California," and "The Climatic Changes of Later Geological Times."

A pioneer among American geologists, he began as assistant to Dr. Charles T. Jackson on the Geological Survey of New Hampshire. He occupied, as one of the older State geologists, a prominent place among those who have laid the foundation of American field geology. The work he accomplished as United States Geologist of Lake Superior, and as State Geologist of Wisconsin, of Iowa, and of California, was of high grade, and the important publications he issued in connection with these surveys have stood the test of time. After the Legislature of California had refused to continue their appropriations for the State Survey, he continued it for some time at his own expense. The "Yosemite Book" was issued in connection with that Survey, and on his return to the East from California he published at Cambridge six volumes of the "Geological Survey of California."

He published a number of minor reports and papers in scientific journals. He wrote the article "United States" in the ninth edition of the Encyclopædia Britannica and the definition of many of the geological and mining terms in the Century Dictionary. Among his other important publications should be mentioned his "Metallic Wealth of the United States," the result of extensive travels throughout the country, and his "Studies in Geographical and Topographical Nomenclature." His scientific sympathies extended over a broad field. Besides his special geological work he was interested in geographical questions, and had made a profound study of Mining, Metallurgy, and Chemistry, so far as they relate to geology.

A man of strong convictions, he was naturally impatient with many of the cruder theories of the younger school of geologists, and was often considered as not sufficiently in touch with modern methods. He was devoted to the interests of his students, allowing them the fullest access to the materials he had brought together, and most generous in his dealings with his fellow workers. He brought together during his lifetime a large and valuable library, which he gave to the Museum as the nucleus of a library for the Sturgis-Hooper Professorship. The greater part of it, about 5,000 volumes and nearly 1,500 pamphlets, as well as the palæontological collections he possessed, mainly from California, were already deposited in the Museum at the time of his death.

He retained his activity to the last, and his death found him occupied in writing papers on the origin and mode of occurrence of iron and its ores, and in their classification.

In connection with my work on the Florida coral reef, Mr. L. S. Griswold made an exploration into the Everglades, in order to determine if practicable how far inland the coral reef region extended. He penetrated inland a considerable distance, reaching the edge of the Everglades at three points. His explorations have added greatly to our geological and geographical knowledge of the region. His report will be published as an Appendix to my Notes on the Coral Reefs of Florida, now in the press. (Bull. Mus. Comp. Zoöl., Vol. XXVIII. No. 2.)

While preparing this work an interesting report on the borings of the Key West Artesian well was sent in to me by Dr. E. O. Hovey. From the report of Dr. Hovey it is evident that the Florida coral reef is, as I have always contended, of very moderate thickness, well within the range of depth at which corals can grow, and that it rests upon Pliocene deposits. (Bull. Mus. Comp. Zoöl., Vol. XXVIII. No. 3.) A further examination of the borings of the Key West Artesian well will be made by Dr. W. H. Dall and Dr. Woodward, in connection with material collected by the U. S. Geological Survey at other deep wells extending into the Tertiary strata of Florida and of Texas.

In pursuance of a plan to investigate the coral reefs of the Pacific, I spent some weeks on the Great Barrier Reef of Australia. Dr. W. McM. Woodworth and Dr. A. G. Mayer of the Museum accompanied me as assistants. A complete outfit for sounding and for collecting pelagic animals was shipped to Sydney and placed on board the steamship "Croydon," which had been chartered for the expedition. A complete photographic outfit, as well as the equipment necessary for taking care of the collections, was also sent out. Unfortunately the explorations we made were restricted by the boisterous weather we encountered along the coast of Australia. I succeeded, however, in examining the reef sufficiently in detail to satisfy myself that subsidence had played a very insignificant rôle in the formation of that great reef. A preliminary account of the expedition has been published in the September number of the American Journal of Science. It was a great disappointment to me to be unable to carry out either my plans for sounding off the sea face of the barrier reef, or for making a number of deep-sea hauls in the same district with the self-closing Tanner net; — the more so as we were specially well equipped for doing this work, and I anticipated a large harvest of pelagic material from a district about which so little is known.

I am, however, satisfied that this visit to the Great Barrier Reef of Australia, however unsuccessful it has been, will enable me to carry out future expeditions to the coral districts of the Pacific with far better ideas of the difficulties to be encountered and of the nature of the problems to be solved than if I had made my trip to Australia after an examination of the coral islands of the Southern seas. As it would have been impossible for me to have carried on my own investigations regarding the Great Barrier Reef and to have made a collection of the corals of the region at the same time, I sent Professor H. A. Ward of Rochester to Australia, and he is at present on the Great Barrier Reef, making a collection of the corals of the reef for the Museum. From what I hear, he has been favored with better weather, and has been most successful in gathering a representative collection of the corals of the northeast coast, mainly in Torres Straits.

I have to thank for information regarding my trip to Australia Mr. W. Saville Kent, formerly Fish Commissioner of Queensland, Commander C. D. Sigsbee of the U. S. Hydrographic Office, and especially Admiral Wharton, R. N., Hydrographer to the Admiralty, whose advice was of the greatest value. To Mr. H. M. Gray, the managing director of the India Rubber and Gutta Percha and Telegraph Works, Limited, I am also indebted for information regarding the deep-sea sounding machinery in use on the telegraph steamer of their company.

Through the kindness of the Hon. Richard Olney, the Secretary of State at Washington, letters of introduction to the governments of Queensland and New South Wales were sent to me from the Foreign Office, and to prominent officials of the Australian colonies from the Colonial Office, in London, and by Sir Julian Pauncefote, H. B. M. Ambassador at Washington. The Governor General of Queensland, Lord Lamington, facilitated my explorations in every possible way, and the "Croydon" received every courtesy in all the ports we touched at.

To Colonel Duffield, the Superintendent of the U. S. Coast and Geodetic Survey, I owe valuable assistance regarding the expedition of Mr. L. S. Griswold to the Everglades.

Some radical changes have taken place during the past year in the organization of the Museum. The Department of Petrography has been merged into that of Mineralogy. Professor Wolff having been placed in charge of the collection of mineralogy, it was natural that he should transfer his former department into the section of Mineralogy.

Professor Smyth will also hereafter find such facilities as may be given to mining geology in the same section of the Museum, until technical and applied geology, or geology as a whole, are in their turn transferred to more spacious and more appropriate quarters than those they now occupy.

It is becoming self-evident that, with the great increase in the number of Professors and students of the Zoölogical, Geological, and Geographical Departments in the University, the continuance of their present intimate connection with the Museum is only a question of time and money.

We are rapidly approaching the condition when each one of the Natural History Departments must work in its own quarters independently, supervising its own instruction, publishing its own researches, and having the charge of its own collections; all holding, in short, the same relation to one another that the Botanical and the Mineralogical sections and the Peabody Museum now hold to the University Museum.

This naturally brings up the question of carrying on the various departments of Natural History contained in the University Museum quadrangle. With the gradually decreasing means now at their disposal, we cannot hope even to keep up with the progress of science. For a healthy increase of the work done in the different sections of the Museum a very large annual income is needed, — two or three times larger at least than is now at our disposal.

With our present resources we are barely keeping alive, and the future has nothing in prospect beyond the merest routine work. Each of the Departments needs funds for additional Professors and Assistants, as well as for the running expenses of each Professorship, to enable them to carry on original research. An annual income is needed to send out expeditions both on land and at sea to collect material connected with the questions of the day, and a publishing fund large enough to allow the publication of the original work of the members of each Department, be they Professors or students. With the enormous increase in the number of scientific publications annually issued, the funds at the disposal of the University Library are totally inadequate to purchase the books wanted for each branch of the Museum. To this should be added the building and maintenance of a Marine Laboratory, which is as important an adjunct to the Natural History Departments of the University as a Physical or a Chemical Laboratory.

The public to-day can hardly realize the interest that was taken by the Commonwealth and the friends of Professor Agassiz in the establishment of the Museum of Comparative Zoölogy. Nor is it likely that they fully appreciate the part which the Museum has played in the development of the study of Nature at Harvard and elsewhere in this country.

The Commonwealth came forward most generously, and sustained, often under most unpropitious circumstances, the interest it had shown in the Museum. From the treasury of the Commonwealth no less than $240,000 has been received at various times, and up to the beginning of 1895 more than $1,580,000 (exclusive of income) has been received from all sources, including the State grants, the subscriptions of friends, and the gifts of the family of Professor Agassiz.

This large sum is represented by the buildings, exclusive of the Botanical and Mineralogical sections; by the collections and the work expended upon them; by the Library, and an extensive series of publications (20 quarto volumes of Memoirs and 30 octavo volumes of Bulletins); and by an endowment of over $580,000, the income of which is available for the salaries and running expenses of the Museum of Comparative Zoölogy and its allied departments.

Soon after the death of Professor Agassiz the Trustees of the Museum deemed it advisable to ask the Legislature to transfer the interest of the State in the Museum to the President and Fellows of Harvard College, who already held pre-eminent rights in some of the funds and collections. This connection with Harvard University led to a great increase in the study of Natural History, both in the undergraduate and graduate departments. The Museum itself has always been primarily an institution for research, although its collections and laboratories are to a limited extent available to undergraduates.

A further concentration of the Natural History departments of the University was effected in 1888–89 by the building of the Botanical and Mineralogical sections, the Geological and Geographical Departments having before that time found their abode in the Museum Laboratories. Quite early in the history of the Museum the establishment of the Peabody Museum led to the transfer to that section of the University Museum of all the collections brought together by Professor Agassiz and others which related to that Department. What now remains to be built is a comparatively small section of the Museum of Comparative Zoölogy, and the completion of the wing devoted to the Peabody Museum. This, when erected, would complete a University Museum, in which are duly recognized the claims of the undergraduates, of the advanced student, and of the investigator. The staff of instructors through its connection with Harvard must always retain the highest character, and the amount of original work which can be carried on there by investigators will depend entirely upon the interest shown by the public in keeping up the resources for investigation and publication available to the officers of the University Museum.

The want of the southwest corner piece of the Museum is severely felt in the crowding of the Laboratories available for Zoölogy and Geology, both for undergraduates and advanced students. Nothing can be done to complete the system of Exhibition Rooms planned for Geology and Geography until that section is built. This will require about one hundred thousand dollars for its erection and equipment. No greater advantage can accrue to the Natural History Departments of Harvard University than the completion of the building forming the quadrangle of the University Museum.

The income of at least two millions of dollars is necessary to carry out the plans I have sketched and to maintain a Marine Laboratory.

It is now fifty years since the founder of the Museum landed in this country. Since his death the Museum has more than doubled in size, but its endowment has remained stationary, and its income has decreased with the fall in the rate of interest since 1874. May we not hope in this fiftieth anniversary to obtain the funds necessary to complete the building, and to carry on the whole Museum on a scale proportional to the demands of a great University.

ALEXANDER AGASSIZ.

Cambridge, October 1, 1896.

REPORT OF MEMBERS OF THE DEPARTMENT OF GEOLOGY AND GEOGRAPHY.

In recognition of the good share of attention given under the Department of Geology to instruction in Geography, a change in the name of the Department has been made, as indicated in the above heading. Herewith is associated for the present the instruction in Mining and Metallurgy, although it may be anticipated that, with the fuller development of these subjects, they will in time be placed in an independent department, similar to that which a year ago was constituted by bringing together the courses in Mineralogy from the Department of Chemistry, and those in Petrography from the Department of Geology.

The liberal appropriations made by the Council of the University Library for several years past have made it possible to obtain a nearly complete collection of large-scale topographical maps of the various countries of Europe. As further expenditure in this direction will henceforward be limited to the purchase of new map-sheets, as they are issued, it is desired now to turn attention to the accumulation of the large-scale maps and detailed memoirs issued by the various geological surveys abroad. A good beginning in this direction has been made in the Whitney library, where the publications of the geological surveys of Germany, Italy, Spain, Sweden, and Switzerland are already in hand, as far as published. A second step has been taken during the past year by the allotment of a special sum from the funds of the University Library for the purchase of geological maps. The maps of Saxony and a considerable number of those of England have thus been bought. It is hoped that a sum, equivalent to that allowed for topographical maps in recent years, may now be appropriated for geological maps for several years to come.

The better concentration of geological and geographical materials is promoted by a plan proposed during the past winter. Geographical journals and topographical maps, hitherto in the Library of the Museum, have been transferred to the University Library, in so far as they are not duplicates. In like manner, geological journals, reports, and maps in the University Library will be deposited in the Museum Library, so far as may be needed to fill out the Whitney collection. In this manner, each collection will be as thorough as it can be made. The recent alteration in the University Library building has allowed opportunity for concentrating all the geographical journals on a single group of shelves, so that they may be most conveniently consulted.

REPORT ON THE COURSES OF INSTRUCTION IN GEOLOGY AND GEOGRAPHY.

During the Academic year 1895–96, the following named courses of instruction were given in the laboratories and in the field by the instructors of the Department of Geology and Geography.

Instruction in General Geology.

1. (Geol. 4.) A course in Elementary Geology; two lectures a week by N. S. Shaler, with a third lecture and an hour for special exercises by R. A. Daly, assisted by F. C. Schrader, and with required reading and field-work. Attended by two hundred and sixty-two students.

2. (Geol. 8.) A course in General Critical Geology; two lectures a week by J. B. Woodworth, with an additional hour for review. During the autumn and spring ten half-day excursions were made in the field to points in the vicinity of the University. Each student prepared a thesis during the winter months, and a map and report upon some locality in the neighborhood. Twenty-two students took this course.

3. (Geol. 22 *a*.) A course in Field Work and Geological Mapping, designed to afford training in original investigation, with work in the library and in the preparation of geological reports, supplemented by special training in the experimental method of solving field problems. Conducted by T. A. Jaggar, Jr., under the direction of N. S. Shaler, W. M. Davis, and J. E. Wolff. Conferences were held once a week during the year. The course was attended by three students.

4. (Geol. 22 *b*.) An advanced course of research for special geological investigation in the field and laboratory, designed for second-year students who have already passed in the work of 22 *a*. The work in this course is under the personal supervision of the different instructors of the Department. It was attended by one student.

Instruction in Meteorology and Physical Geography.

5. (Geol. 2.) A half-course in Physiography, by W. M. Davis, assisted by L. S. Griswold. Two or three lectures a week, with laboratory work and recitations, first half-year. Attended by thirty-four students.

6. (Geol. 1.) A half-course in Elementary Meteorology, by R. DeC. Ward. Two or three lectures a week, with laboratory work and recitations, second half-year. Attended by fifty-eight students.

7. (Geol. 3.) A half-course in Physiography and Meteorology, by W. M. Davis and R. DeC. Ward. Two lectures a week. Attended by twelve students.

8. (Geol. 7.) A half-course in the Physiography of Europe, by W. M. Davis. Lectures, library work, and reports, second half-year. Attended by seven students.

9. (Geol. 20.) A course in advanced Physiography, by W. M. Davis. Conferences held once a week. Attended by five students.

Instruction in Palæontology.

10. (Geol. 14.) A half-course in Palæontology, by N. S. Shaler, assisted by R. T. Jackson. Two lectures a week, with theses. This course was attended by fifteen students.

11. (Geol. 13.) A course in Invertebrate Palæontology, by R. T. Jackson. Two lectures a week with laboratory work. Attended by three students.

12. (Geol. 15.) A course in Historical Geology, designed to train advanced students in the use of fossils in determining geological horizons, by N. S. Shaler, assisted by R. T. Jackson. This course was taken by four students.

Instruction in Special Geology.

13. (Geol. 16.) A half-course in Glacial Geology, by J. B. Woodworth. Lectures once a week, with additional hours for conferences, field and laboratory work. Attended by two students.

Instruction in Mining Geology.

14. (Geol. 10.) A half-course in Mining Geology, by H. L. Smyth. Lectures, laboratory and field work; three times a week, first half-year. Attended by six students.

15. (Geol. 11.) A half-course in Geological Surveying, by H. L. Smyth. Lectures, laboratory and field work; three times a week, second half-year. Attended by seven students.

16. (Geol. 18.) A course in Economical Geology, by J. D. Whitney. Lectures three times a week, with required reading and theses. Attended by two students.

NOTE. — The instruction in Petrography is now announced under the department of Mineralogy and Petrography.

Summer Courses. 1896.

17. (Geol. S. 1.) A course in Elementary Geology, beginning July 3, and lasting six weeks, under the direction of N. S. Shaler, by G. E. Ladd. Instruction was in the form of lectures, laboratory work, and field excursions. Besides the systematic lectures by Mr. Ladd, special subjects were treated by Professors Shaler and Davis. Attended by thirteen students.

18. (Geol. S. 2.) An advanced course in field study, beginning July 3, at Cambridge, and continuing six weeks, in Southern New England, by N. S. Shaler and J. B. Woodworth. Attended by five students.

19. (Physiog. 1.) A course in Elementary Physiography, beginning July 3, and lasting six weeks, by W. M. Davis, assisted by J. M. Boutwell. Lectures, laboratory work, and excursions. Attended by fifty-three students.

20. (Physiog. 2.) A course in Advanced Physiography, beginning July 3, and lasting six weeks, by W. M. Davis. Conferences, reports, and theses. Attended by one student.

REPORT ON COURSES IN GENERAL GEOLOGY AND PALÆONTOLOGY.

By N. S. Shaler.

A half-course of lectures, designed to set forth the phenomena of Geology to beginners, and known as Course 4, was given as in previous years.

The laboratory and field work of the course in Elementary Geology was conducted under the general supervision of Professor Shaler, by Mr. Reginald A. Daly, with the assistance of Mr. F. C. Schrader, following the plan of instruction developed in previous years by Mr. R. E. Dodge. Substantial additions were made to the teaching collection, mainly in the form of fossils and lithological specimens purchased from dealers. The system of numbering and cataloguing these collections mentioned in the last Report upon this course has been maintained. The use of a clinometer compass manufactured by F. Barker & Son of London, and larger than that heretofore employed, was introduced in the field work.

Mr. Daly gave also a course in Elementary Geology to students in Radcliffe College, following the plan of instruction noted in last year's report. By this arrangement the students of Radcliffe College are admitted to the Geological Laboratory on equal terms with those of Harvard College. In June, Mr. Daly, having received the degree of Ph. D. and having been appointed to a Parker Fellowship, resigned his position as Instructor in Geology to take up the study of geology in Europe.

Mr. J. B. Woodworth reports as follows on the instruction in General Geology (second course, Geol. 8), and Glacial Geology (Geol. 16): —

The second course in General Geology (Geol. 8) was completed by twenty-two men, the number in attendance being somewhat larger than during the previous year. The survey of square-mile areas in the vicinity of the University by students in this course was continued as heretofore. Each year there is a noticeable increase in the effacement of our glacial deposits. It is hoped that, by carefully recording the occurrence of these superficial phenomena, the field work of our students will preserve the knowledge of an interesting district, the natural features of which are rapidly vanishing. The same advance of culture upon the natural ground in the environs of Boston has rendered it desirable to extend the regular field excursions to more distant points than were formerly visited. Half-day excursions were therefore made again this year to Attleboro, Plainville, and Pondville, Mass. During the April recess, a voluntary excursion was made to Martha's Vineyard for the purpose of examining the terminal moraine on that island, and of making a section of the Gay Head cliffs. Mr. Francis Noyes Balch, a student in the course, succeeded in verifying the reported occurrence of a substance resembling amber in the Gay Head section. The teaching collection was farther enriched by a collection of lignite from the non-marine Cretaceous of the island, and by characteristic lithological specimens from the Cretaceous, Neocene, and Pleistocene beds. In the lectures, more attention than usual was given this year to the light which the alluvial deposits of modern great rivers throw upon the structure and origin of certain ancient fresh water or non-marine deposits of the Carboniferous and Triassic Periods. The subject of joints and fractures in rocks was illustrated by new and undescribed material largely collected on the excursions made with students in this course.

The course in Glacial Geology (Geol. 16) was taken by two men. In addition to the instruction given, some time was spent with one student in elaborating a classification of glacial deposits, paying especial attention to the recognition of the moraine terrace or ice-contact slope at the rear of sand plains and moraines as a key to the understanding of the relations of the departing ice sheet to the drift laid down about it. Excursions were made tending to show the widespread distribution of this feature in Southern New England. Trips were also conducted to Mt. Monadnock, N. H., to the Falmouth moraine and the Queen's River boulder belt in Rhode Island, in the interest of students in this course.

In addition to the instruction in the above courses, work was done by Mr. Woodworth with the aid of Mr. F. C. Schrader, in collecting and preparing a series of rocks for the University of Missouri, and in gathering material from localities in Eastern Massachusetts for exchange with the laboratories of other institutions. As Assistant Geologist of the U. S. Geological Survey, Mr. Woodworth spent a week in January in the examination of the Richmond coal basin, work on which was resumed again in June. Other work done in connection with this organization is set forth in the report of Professor Shaler in the 17th Annual Report of the Director of the Survey.

Dr. R. T. Jackson reports that the collections used in teaching Palæontology are in good condition, and have received some desirable accessions. A new feature has been introduced in wall diagrams for class use. These diagrams are photographic enlargements of structural and developmental figures of fossils, taken directly from original publications. The method was adopted first by Dr. W. M. Woodworth of the Zoölogical Department, and it has proved to be very useful in palæontological instruction as well.

A few palæontological papers and specimens have been received as gifts from Professors C. E. Beecher and A. Hyatt, and Messrs. Wm. F. E. Gurley, C. L. Whittle, and J. B. Woodworth.

The most important accessions of material to the Department are choice specimens of *Metacrinus rotundus* and *Nautilus pompilius*, both in alcohol, purchased of Ward's Natural Science Establishment. From the same source was obtained a collection of Permian fossils from Europe. A collection of Permian and Cretaceous fossils from Kansas was purchased of Mr. C. N. Gould. A choice lot of Cretaceous Invertebrates, recently collected by Mr. C. L. Johnson, in Texas, Alabama, and New Jersey, was purchased of the Wagner Free Institute of Science. A limited number of Silurian Sponges and Brachiopods, showing silicified arms and other details of structure, was purchased of Mr. G. K. Greene.

As in previous years, Dr. Jackson spent a considerable part of his time in working on the Palæontological collections of the Museum.

Mr. T. A. Jaggar, Jr., reports as follows concerning the advanced courses in Geological Field and Laboratory Work: —

During the past year, research in general geology has been carried on in two courses: Geology 22*a*, planned for students just entering upon geological research work in the University, and Geology 22*b*, intended for more experienced men. The work of the first course was closely supervised by Mr. Jaggar, and the students were individually given much time in the field and laboratory by the instructor. In the fall they were offered a series of seven general excursions conducted by the officers of the department to various carefully studied localities in New England, so that by note-taking, collateral reading, and conferences each student attained at the outset a somewhat varied field experience as a basis for original work. During the winter months a short course of lectures was given by Mr. Jaggar on the experimental or synthetic method of interpreting geological processes, and this was supplemented by regular laboratory work in devising, constructing, and applying special apparatus for the solution of problems in dynamical geology. During the spring season the northwestern part of the Boston basin was carefully studied in three sections, especially with a view to discovering the source of the remarkable series of fragments included in the younger eruptive rocks which cut the Somerville slate; the adjacent crystalline rocks of Belmont, Arlington, and Medford were found to contain many types identical with these inclusions, and the results of this investigation will be published in the near future.

In course 22*b*, Mr. J. E. Woodman prepared, under the supervision of Professor Shaler, a report "On the Geologic Forces and Forms of the North Jersey Coast," based upon field work done during the previous summer.

Following the plan carried out by Mr. Ward in Meteorology, Mr. Jaggar, at the request of Mr. W. A. Baldwin, Superintendent of Schools in Belmont and Danvers, gave a course of lectures to a class of fifteen teachers in Danvers, Mass., on "Physiographic Types, as illustrated in Southern New England." At the close of the season an extended excursion was made with the class in Essex County, where examples of many typical geographical forms were seen and studied in the field.

Mr. Jaggar has devoted much time to the construction and arrangement of special pieces of apparatus, with the view of establishing a Laboratory of Experimental Geology. Two basement rooms in the Museum have served well for this purpose, being immediately associated with the motor, dynamo, petrographical workshop, and photographic room.

The students of Geology 22*a* carried on experimental work on two subjects. Mr. C. W. Dorsey made a series of models of glacial sand plains by means of an apparatus imitating the conditions of glacial drainage, and the resulting delta deposits were studied minutely with respect to form, bedding in cross-section, influence of water level, and other variable conditions. Messrs. W. A. Baldwin and E. E. McCarthy, the other students of the course, were led through a series of experiments imitative of the deformation of stratified rocks under compression, following in general the plan adopted by Mr. Bailey Willis in his work on the "Mechanics of Appalachian Structure" (13th Ann. Rep. U. S. Geol. Survey). For general work of this sort a massive compression chest was constructed of oak, provided with two heavy thrust pistons at opposite ends, which can be advanced by screws. The models are cast from mixtures of wax and plaster, and are then submitted to slow compression under a heavy load of fine shot. The apparatus is so made that the amount of movement and pressure is registered on special indices at various points; a metronome is used for regulating the rate of compression. Each model is removed and photographed at different stages of deformation, and the records so obtained are used by the students for comparative study with structures in the field and with published descriptions of similar phenomena.

In addition to the apparatus above described, and in preparation for a special course in Experimental and Dynamical Geology, to be given in 1896–97, the following instruments have been collected: —

Machine for the reproduction and measurement of Ripple-mark.

Ring-shaped tank for producing a continuous current of water; for the study of Ripple-drift, rate of transportation of material in suspension, etc.

Five vessels of different form, for the study and optical projection of vortical movements in a liquid, as affecting conditions of transportation and deposition.

Gas Furnace, model Leclerc and Forquignon, made by Lequeux in Paris, with adjustable blowpipe and improved hydraulic blast (after Damoiseau). The latter may also be used as sucking or vacuum pump. This apparatus is most useful for general work in the synthesis of minerals and rocks.

Electric Furnace, model O'Neill, for experiments requiring excessively high temperature.

The following instruments are in preparation: —

Geyser apparatus, after the models of Petersen and Andreæ.

In addition Mr. Jaggar has devoted some time to the preparation of photographs, lantern slides, and diagrams illustrative of the work of former experimenters.

The following papers, results of work in the experimental laboratory, are in preparation: —

Ripple-mark, and related Geologic Phenomena.

On the Geological Work of Vortices and Eddies.

An Experimental Study of Glacial Delta Deposits.

The Influence of Rate of Compression and of Composite Thrusts, in Rock Deformation.

Summer Courses in Geology.

The elementary summer course was given in Cambridge, under the direction of Professor N. S. Shaler, by Dr. G. E. Ladd. In addition to the systematic instruction by lectures and laboratory work, about twenty field excursions were made to localities easily accessible from Boston, the most remote being Newburyport on the north and Newport on the south. Lectures were given by Professor Shaler on dynamical geology, Professor Davis on physiographic geology, Dr. Jackson on palæontology, and Mr. Woodworth on glacial geology. The course closed with a written examination and a practical test in field work.

The second course in geology in the Summer School was given by Professor Shaler and Mr. J. B. Woodworth. One week was spent in Cambridge at the beginning in preparation for the subsequent outdoor work. The districts then visited included the Norfolk County and Narragansett basins, the Island of Martha's Vineyard, and the Triassic valley in Connecticut. These districts afford an exhibition of the Pre-Cambrian, Cambrian, Carboniferous, Jura-Trias, Cretaceous, Miocene, and Pleistocene rocks of Southern New England, with a variety of secondary structures. Five students took this course, three of these being registered in the University during the college year.

REPORT ON COURSES IN PHYSICAL GEOGRAPHY.

By Professor W. M. Davis.

The most important changes during the past year have been the addition of field excursions to the course in Elementary Physiography (Geol. 2), the transfer of the course in Elementary Meteorology to Mr. Ward, and the presentation for the first time of the course on the Physiography of Europe, by Professor Davis. As in former years, all these courses were repeated for the students of Radcliffe College.

The field excursions in Elementary Physiography, conducted by Professor Davis and Mr. Griswold, were introduced because the experience of previous years made it only too plain that our undergraduate students have no sufficient acquaintance with actual land forms as objects of conscious study, and that without such acquaintance it was difficult for many of them to acquire the art of reading maps, on which much of the laboratory work depends. The excursions proved of distinct value, although the necessity of limiting them narrowly in time and expense was somewhat embarrassing.

In the course on the Physiography of Europe, the sets of large-scale topographical maps of foreign countries, accumulated in the University Library chiefly during the last five years, and the collection of grouped sheets of the same maps mounted for laboratory use, were put into active service and proved to be simply invaluable in giving vivid ideas concerning the facts of geographical form. Exercise in reading these maps largely superseded reference to written text, although the latter was drawn from the most recent monographs accessible. In view of this, an article was prepared for the Chicago "Journal of Geology," advocating the more general use of large-scale maps in teaching, and indicating by special examples the character of the results thus obtainable. One of the most noticeable advantages of the maps was that they were susceptible of uniform treatment in study and description; while the use of texts required a frequent change of point of view, aim, and method, according to the habit of the author consulted. The absence of any complete and consistent method of treating geographical subjects became inconveniently conspicuous during the progress of the course. It was found impossible to illustrate the Physiography of Europe with any thoroughness by means of the Gardner collection of photographs, for, in spite of the large number of foreign views in the collection, it does not yet include a systematic series selected to represent the leading physical features of each country. It is therefore suggested that special effort be directed, during the coming years, to making good this deficiency. The time of a well prepared and well disposed graduate, during a year of foreign travel, might be pleasurably and profitably given to this task.

The course in Advanced Physiography was devoted, as in former years, to individual study of selected problems. Mr. Gulliver completed his discussion of the development of shore lines, embodying his results in a thesis which was accepted as contributing towards the degree of Ph. D., which he secured at the end of the year. He is now continuing his studies abroad, having already during the past summer visited a number of interesting shore localities. Mr. Woodman undertook the study of Brittany, as an example of an old land adjoining a denuded coastal plain (the western part of the Paris basin), with special attention to the courses of rivers as indicative of the area of old land from which the coastal plain cover has been stripped. In another connection, the same student examined the western slope of the central plateau of France, with the same problem in mind. Although not intended to lessen the importance of local field study, the investigations by Messrs. Gulliver and Woodman may be taken to confirm the contention that original physiographical research may be based on good maps, provided the student has acquired the art of map reading. In regions of complicated structure, geological maps and text constitute an essential supplement to topographical maps. Mr. Curtis undertook a novel subject: the design of a coastal region in which various features should be rationally associated, and its representation in a model. The essentials of this task were that every element of form should be reasonably accounted for by citation of a similar form in nature; and that the association of these forms in the designed model should follow a reasonable scheme of geographical development. Mr. Wadsworth undertook a description of volcanic topography with the intention of giving a better proportion of "values" to the various forms, and relegating symmetrical volcanic cones to a less prominent rank than is given to them in current text-books.

Summer Course in Physiography.

The summer course in Elementary Physiography seems to have met a popular want, as the number attending it increased from nine in the summer of 1895, when it was first offered, to fifty-three this year. In this course Professor Davis had the assistance of Mr. J. M. Boutwell, of the College class of 1897. With the exception of one person who was enrolled as a "student," all the others were actually engaged in professional work. The greater number were teachers in Massachusetts grammar schools, but teachers in high schools, academies, and normal schools, and school superintendents, were also represented. Instruction was given by morning lectures, illustrated by diagrams, maps, and lantern slides, and frequently interrupted for informal conferences; by laboratory work, in which many diagrams and maps besides those used in the lectures, were conveniently placed for personal study; and by field excursions to Waverly, Newtonville, Nantasket, Provincetown, and Greenfield, Mass. It was manifest from the avidity with which the teachers accepted a rational method of studying and teaching geography that empirical methods are outgrown, even though they may still be preserved by those who have no escape from them. Another result of the course was the determination to introduce, in the next session of the school, a series of systematic exercises in outdoor observation and description of elementary forms, so as to overcome if possible the embarrassment now prevailing among teachers when in the presence of nature and in the absence of a text-book. On the whole, it may be said that the summer physiographical work with teachers, as now developing, takes high rank among the duties of the year.

It was particularly with a view to introducing observational work at an early stage in the teaching of geography that Professor Davis prepared for Connecticut and Rhode Island small pamphlets on "The State Topographical Map as an aid to the Study of Geography in Grammar and High Schools." These pamphlets have been published by the Board of Education of the respective States, and distributed to the public schools of grammar grade. Similar pamphlets will probably be published by Massachusetts and New York. The following extract will indicate the intention of these efforts: "Lack of experience in the use of the State Map in field teaching is, for the present, a necessary result of the recent completion of the map. Three, four, or five years hence, a similar lack of experience will be interpreted, by those who understand the advance in the teaching of geography now in progress, as the result of the neglect of the opportunities for self-improvement that every teacher is in duty bound to use to the utmost. Fifteen or twenty years hence, it will be a reproach to the school in which the younger teachers of that time began their education, if they do not bring from it an acquaintance with home geography and the geography of the State, such as the proper use of the State Map in the grammar schools will surely develop."

Instruction in Meteorology.

Besides giving the lectures and conducting the laboratory work of the course in Elementary Meteorology during the second half-year, Mr. Ward gave much time to accumulating material in preparation for the course on Climatology, to be offered for the first time during the coming year. The course of informal lectures to teachers given by Mr. Ward in Hingham a year ago was repeated during the past winter at Braintree, North Abington, Brockton, and Natick. At each place the course consisted of ten lectures, the attendance being about two hundred teachers in all. As a result of this work, instruction in local observation and its systematic correlation with the practical uses of the daily weather maps has been introduced to some extent in all the places above mentioned. This work seems likely to grow rapidly during coming years. A paper on "Meteorological Observations in Schools" was prepared for the Connecticut State Board of Education by Mr. Ward, and was published by that Board as a School Document. Mr. Ward continued to act as editor of the "American Meteorological Journal," to which work he devoted much of his time, until the suspension of the Journal with the April number, at the close of the twelfth volume; since then he has undertaken to report current notes on Meteorology to "Science." In conjunction with Mr. A. L. Rotch, proprietor of the Blue Hill Meteorological Observatory, Mr. Ward has given some time to the accumulation of climatological reports in the Library of the Astronomical Observatory of Harvard College. Through the active support of the Director of the Observatory, this Library promises to become exceptionally complete in climatological material.

REPORT ON COURSES IN MINING GEOLOGY.

By Assistant Professor H. L. Smyth.

In 1895–96 the courses in Mining Geology and Geological Surveying were given by Assistant Professor Smyth, as in the year preceding, in the Mineralogical Section of the University Museum, where also, by the courtesy of the Department of Mineralogy and Petrography, the library of Professor Pumpelly, and the special collections for these courses, are still temporarily installed.

The course in Mining Geology began with the Academic year, instead of in December as in former years, and ended at the mid-year examinations. It was followed in the second half-year by the course in Geological Surveying. For the coming year noteworthy changes are made in these courses. Mining Geology (Geology 10) becomes a full course, running through the year, and is thrown open to College students; while Geological Surveying (Geology 11) is transferred to the new group of courses in Mining and Metallurgy, as Mining 1, and remains open only to students in the Scientific School.

No formally announced excursions were made during the year, but several students who intend to specialize in Economic Geology accompanied Mr. Smyth on professional visits to Lake Superior, California, and South Dakota.

The time of the instructor, aside from his University duties, was entirely devoted to the completion of a Monograph on the Michigamme District in Michigan, and to the preparation of a paper on Magnetic Observations in Geological Mapping, the latter soon to appear in the Transactions of the American Institute of Mining Engineers.

During the year considerable additions have been made, by gift and purchase, to the collections in Economic Geology, the most important being very complete suites of specimens of the iron ores and coals of the Southern States, which were generously given by many exhibitors at the Atlanta Exposition. It is to be regretted that the usefulness of the collections continues to be hampered by the lack of room for arrangement and study.

EXCURSIONS AND CONFERENCES.

A SERIES of fourteen geological and geographical excursions was conducted by the instructors of the department, with the co-operation of the geological departments of other New England colleges, during the autumn and spring. These were in general charge of Mr. Jaggar, and were open to members of other colleges and technical schools, and afforded opportunity to obtain a general view of the geology and physical features of Southern New England. Excursions were made to the following localities during the Academic year 1895–96: —

Nantasket, Mass., Mr. L. S. Griswold.
Hoosac Mountain, Mass., Professor Wolff.
Nahant, Mass., Messrs. Woodworth and Jaggar.
Meriden, Conn., Professor Davis.
Salem and Marblehead, Mass., Mr. John H. Sears of Salem.
Plainville and Attleboro, Mass., Mr. J. B. Woodworth.
Niantic and Exeter, R. I., Professor Davis and Mr. J. B. Woodworth.
Monadnock Mountain, N. H., Mr. J. B. Woodworth.
New Haven, Conn., Prof. H. S. Williams of Yale College.
The Middle Susquehanna District, Pa., (April recess,) Professor Davis.
Gay Head, Martha's Vineyard, (April recess,) Mr. J. B. Woodworth.
Cape Ann, Mass., Professor Shaler.
Provincetown, Mass., Professor Davis.
Mount Toby and Bernardston, Mass., Prof. B. K. Emerson of Amherst College.

Twenty-nine conferences were held on Tuesday evenings throughout the year. At each meeting there was a leading paper by an instructor, occasionally illustrated by stereopticon or experimental demonstration. Abstracts of papers presented were published regularly in "Science," under the following titles: —

The Development of Oligoporus, by R. T. Jackson.
Tidal Sand-cusps, by F. P. Gulliver.
Some Features of the Arizona Plateau, by L. S. Griswold.
The Great Barrier Reef of Australia, by J. B. Woodworth.
Notes on Geological Excursions, by W. M. Davis.
The Pirna and Kirchberg (Saxony) Zones of Contact Metamorphism, by T. A. Jaggar, Jr.
Theories of Ocean Currents, by W. M. Davis.

Some Causes of the Imperfection of the Geologic Record, by N. S. Shaler.

Some Features of Joints, by J. B. Woodworth.

The Geology of the Woonsocket Basin, by F. C. Schrader.

Preliminary Report on the Stamford Gneiss, by W. H. Snyder.

Notes on the North Jersey Coast, by J. E. Woodman.

Some Occurrences of Eruptive Granite in the Archæan Highlands of New Jersey, by J. E. Wolff.

On the Origin of the Copper Deposits of Keweenaw Point, by H. L. Smyth.

On the Geological Work of Vortices and Eddies, by T. A. Jaggar, Jr.

The Harvard Meteorological Stations in Peru, by R. DeC. Ward.

Geography and Geology for Training and Elementary Schools, by R. E. Dodge.

Experiments imitative of Glacial Esker and Sandplain Formation, by C. W. Dorsey.

An Elementary Presentation of the Tides, by W. M. Davis.

Tidal Scour, by F. P. Gulliver.

Note on Penning's Field Geology, by T. A. Jaggar, Jr.

Longshore Transportation on the North Jersey Coast, by J. E. Woodman.

Ice Phenomena in Green Bay, Lake Michigan, by E. P. Carey.

On the Function and Systematic Importance of the Aptychus in Ammonites, by C. R. Eastman.

The Quartz Porphyry and Associated Rocks of Pequawket Mountain, N. H., by R. A. Daly.

April Recess Excursion to the Middle Susquehanna, Pa.,by W. M. Davis.

THE GARDNER COLLECTION OF PHOTOGRAPHS.

THE Gardner Collection of Photographs has been increased by a considerable number of views, secured chiefly by purchase, under the direction of a committee consisting of Messrs. Woodworth, Daly, Griswold, and Ward. In the latter part of April an exhibition of about a thousand photographs, selected from the collection to exhibit different subjects in geology and geography, was made on the lower floor of Massachusetts Hall, attracting a satisfactory attendance of students and teachers, and bringing to the attention of many persons for the first time the existence of the considerable resources of the department in this direction. The most notable addition to the collection, a series of views taken by W. H. Rau along the line of the Lehigh Valley Railroad, and presented by Mr. Charles S. Lee, general passenger agent of that road, was received just in time to be displayed in the exhibition.

PUBLICATIONS BY OFFICERS AND STUDENTS OF THE DEPARTMENT OF GEOLOGY AND GEOGRAPHY SINCE THE LAST REPORT.

By N. S. Shaler: —

1. Administrative Report of Work done in the U. S. Geological Survey for the Year 1893–94. 15th Annual Report of the Director of the U. S. Geological Survey. Washington, 1895, pp. 160, 161.

2. Preliminary Report on the Geology of the Common Roads of the United States. 15th Annual Report of the U. S. Geological Survey for 1893–94. Washington, 1895, pp. 255–306. Also separately printed.

3. The Geology of the Road-building Stones of Massachusetts, with some Consideration of similar Materials from other Parts of the United States. 16th Annual Report of the U. S. Geological Survey, 1894–95, Part II., pp. 277–341. Washington, 1895. Also separately printed.

4. Origin, Distribution, and Commercial Value of Peat Deposits. 16th Annual Report of the U. S. Geological Survey, 1894–95, Part IV. Washington, 1895, pp. 305–314. Also separately printed.

5. Third Annual Report of the Massachusetts Highway Commission. Boston. Public Document No. 54. (With Geo. A. Perkins and W. E. McClintock.) January, 1896, pp. 126. Separately printed.

5. Beaches and Tidal Marshes of the Atlantic Coast. National Geographic Monographs, Vol. I. American Book Co., New York.

7. Some Causes of the Imperfection of the Geologic Record. Science, II., 1895, pp. 858, 859.

8. Sea and Land: Features of Coasts and Oceans, with special Reference to the Life of Man. New York, Charles Scribner's Sons, 1895.

9. Relations of Geologic Science to Education. Annual Address by President of the Geological Society of America. Bull. Geol. Soc. of America, Vol. VII. Rochester, 1896, pp. 315–326. Also separately printed. Also Science, Vol. III., 1896, pp. 609–617.

10. Conditions and Effects of the Expulsion of Gases from the Earth. Proc. Boston Soc. Nat. Hist., Vol. XXVII., 1896, pp. 89–106. Abstract in Science, Vol. II., 1895, p. 281; also in Am. Geol., Vol. XVI., 1895, pp. 244, 245.

11. Domesticated Animals: Their Relation to Man and to his Advancement in Civilization. New York, Charles Scribner's Sons, 1895, pp. 267.

12. American Highways: A Popular Account of their Conditions and of the Means by which they may be Bettered. New York, The Century Co., 1896, pp. 293.

13. The Economic Aspects of Soil Erosion. The Nat. Geog. Mag., Vol. VII., 1896, pp. 328–338, 368–377.

14. The Share of Volcanic Dust and Pumice in Marine Deposits. Bull. Geological Society of America, Vol. VII., 1896, pp. 490–492. Abstract in Am. Geol., Vol. XVII., 1896, p. 93.

15. [Discussion regarding low Temperature Gradients in Mines.] Abstract in Am. Geol., XVII., 1896, p. 100.

16. [Discussion on the Carriage of Boulders by Indians.] Abstract in Am. Geol., 1896, p. 104.

17. High Buildings and Earthquakes. No. Am. Review, Vol. CLVI., 1893, pp. 338–345. (Omitted from previous lists.)

By W. M. Davis: —

1. The Quarries in the Lava Beds at Meriden, Conn. Amer. Jour. Sci., 1896, Vol. I. pp. 1–13.

2. The Physical Geography of Southern New England. Nat. Geogr. Monograph, No. 9, pp. 269–304, November, 1895. Amer. Book Co., New York.

3. La Seine, la Meuse et la Moselle. Ann. de Géogr., Vol. V., 1895, pp. 25–49.

4. The Seine, the Meuse, and the Moselle [original English version of the above]. Nat. Geogr. Mag., Vol. VII., 1896, pp. 189–202, 228–238.

5. Plains of Marine and Subaerial Denudation. Bull. Geol. Soc. Amer., Vol. VII., 1896, pp. 377–398.

6. The Outline of Cape Cod. Proc. Amer. Acad., Vol. XXXI., 1896, pp. 303–332.

7. Large Scale Maps as Geographical Illustrations. Chicago Journ. Geol., Vol. IV., 1896, pp. 484–513.

8. Current Notes on Physiography. Science (through the year).

9. A Speculation in Topographical Climatology. Amer. Met. Journ., Vol. XII., 1896, pp. 372–381.

10. Physiography as an Alternative Subject for Admission to College. School Rev., Vol. III., 1895.

11. A Word with President Coulter [on teaching physical geography, etc., in public schools]. School Rev., Vol. IV., 1896, pp. 173–175.

12. The State Map of Connecticut as an Aid to the Study of Geography in Grammar and High Schools. Conn. School Doc., No. 6, 1896.

13. The State Topographical Map as an Aid to the Study of Geography in Grammar and High Schools. State of R. I. Educ. Pub., 1896.

14. Outline of Summer Courses in Physiography, 1896. Harvard Univ., 8 pp.

By R. T. Jackson: —

1. Studies of Oligoporus. Science, Vol. II., Nov. 22, 1895.

2. Studies of Palæechinoidea. Bull. Geol. Soc. Am., Vol. VII. pp. 171–254, Table and Plates 2–9 inclusive.

3. With T. A. Jaggar. Studies of Melonites multiporus. Bull. Geol. Soc. Am., Vol. VII. pp. 135–170. Plates accompanying this paper are included in the preceding reference.

By R. DeC. Ward: —

1. Reviews of American Meteorological Publications in Annales de Géographie, No. 18, 4 année, 15 Juillet, 1895. Bibliographie de l'année 1894, 8vo, Paris, 1895.

2. Meteorology as a University Course. Am. Met. Journ., December, 1895, Vol. XII. pp. 242–250.

3. The Harvard Meteorological Stations in Peru. Science, Vol. III., March 27, 1896, p. 490.

4. Meteorological Observations in Schools. Conn. School Document, No. 10, 1896. Whole number 123. Conn. State Board of Education, 1896, 8vo, pp. 9.

5. Edited the American Meteorological Journal. An Illustrated Monthly devoted to Scientific Meteorology and allied Branches of Study. Vol. XII. Boston, Ginn & Co., 1895–96.

6. Current Notes on Meteorology. Science, Vol. III., May 1, 1896, and following numbers.

By J. B. Woodworth: —

1. Three-toed Dinosaur Tracks in the Newark Group at Avondale N. J. Am. Jour. Sci., Vol. L., 1895, pp. 481, 482.

2. Harvard University. Summer School of 1896. Fieldwork in Course 2 in Geology. pp. 6.

3. The Gardner Collection of Photographs. Boston Evening Transcript, March 24, 1896.

4. Marsh Gas under Ice. Science, Vol. III., 1896, p. 203.

5. (Notice of) Las Rocas eruptivas del suroeste de la Cuenca de México, by E. Ordoñez. Science, Vol. III., 1896, p. 450.

6. Some Features of Joints. Science, Vol. II., 1895, pp. 903, 904. Also reprinted, pp. 2.

7. (Notice of) Great Barrier Reef of Australia. Science, Vol. II., 1895, p. 743.

8. (Notice of) The Laccolitic Mountain Groups of Colorado, Utah, and Arizona, by Whitman Cross. Science, Vol. II., 1895, pp. 700, 701.

9. (Notice of) Fauna fosil de la Sierra de Catorce en San Luis Potosi, by Aquilera y Del Castillo. Science, Vol. II., 1895, pp. 739, 740.

By T. A. Jaggar, Jr.: —

1. With R. T. Jackson. Studies of Melonites multiporus. Bull. Geol. Soc. Am., Vol. VII. pp. 135–170.

2. The Pima and Kirchberg Zones of Contact Metamorphism. Science, Vol. II., No. 50, Dec. 13, 1895.

3. On the Geological Work of Vortices and Eddies. Science, Vol. III., No. 62, March 6, 1896.

4. Note on Penning's Field Geology. Science, Vol. III., No. 67, April 10, 1896.

5. Edited "Abstracts of the Geological Conference of Harvard University," in Science (through the year).

6. Current Studies in Experimental Geology. Science, Vol. III., No. 71, May 8, 1896.

By F. P. Gulliver: —

1. Cuspate Forelands. Bull. Geol. Soc. Amer., Vol. VII., 1896, pp. 399–422.

REPORT ON THE INSTRUCTION IN PETROGRAPHY.

By Professor J. E. Wolff.

The usual courses were given in Elementary and Advanced Petrography, the former attended by six and the latter by three students. Two students obtained the Ph. D. degree, presenting theses on petrographical subjects, viz.: —

Mr. L. G. Westgate: Thesis "On the Geology of the Northern Part of Jenny Jump Mountain, Warren County, New Jersey" (published in the Annual Report of the State Geologist, 1895).

Mr. R. A. Daly: Thesis "On the Porphyritic Gneiss of New Hampshire."

Professor Wolff continued his work on the Franklin, New Jersey, sheet of the Geological Map of the United States, and was engaged during the winter on the Monograph on the Crazy Mountains. A short paper was published in the American Journal of Science, "On an Occurrence of Theralite in Costa Rica."

The work of consolidating the Laboratories of Petrography and Mineralogy has been completed, and the two rooms used for Petrography on the second floor of the Geological Section of the Museum have been vacated, and their contents transferred to the Mineralogical Section. The Department Library has been arranged and increased by the transfer of the leading periodicals from Gore Hall, and by purchase of books. The Chemical Laboratory is now thoroughly equipped for analysis. A machine for cutting rocks by an endless revolving wire has been added to the workshop.

REPORT ON THE INSTRUCTION IN ZOÖLOGY.

By Professsor E. L. Mark.

The number of students attending courses in Zoölogy during the Academic year 1895–96 was somewhat in excess of the number for the preceding year. The increase was about eight per cent; the increase of the previous year having been ten per cent. The accompanying table gives as usual the numbers in each course from the several classes. A comparison with the numbers of the preceding year shows slight fluctuations in the several courses. The gains have been in courses 1, 3, 7, and 20*a*. In Course 5 there were two additional students who were in regular attendance on lectures, one of whom also did the laboratory work, and in Course 4 there was one such. In the second half of Course 6 there were also two unenrolled attendants upon lectures.

Courses, 1895–96.	Grad.	Sen.	Jun.	Soph.	Fr.	Spec.	Sci.	Total.
Zoölogy 1 . . .	4	17	21	28	36	7	28	141
" 2 . . .	3	9	7	15	2	1	16	53
" 3 . . .	5	5	8	2	0	0	11	31
" 4 . . .	4	5	0	0	0	0	3	12
" 5 . . .	2	5	0	0	0	0	3	10
" 6 . . .	3	3	1	0	0	0	2	9
" 7 . . .	5	7	1	0	0	0	3	16
" 20*a* . . .	10	2	0	0	0	0	2	14
Totals . . .	36	53	38	45	38	8	68	286

Even the small increase (about ten per cent) in the size of the class in Course 1 resulted in considerable inconvenience, and it is becoming a serious question how to provide accommodations for all who elect the course. The nature of the lectures and the laboratory work was not materially changed from that of the preceding year. Some experimental work of a simple sort was tried for the first time, to the satisfaction of the instructor. Dr. Davenport had, as his Chief Assistant, Mr H. R. Linville; as Sub-Assistants, Messrs. J. M. Prather, W. L. Tower, A. Rose, and A. S. Hanna.

As previously, Dr. Parker conducted the course in Zoölogy 2. His Chief Assistant was Mr. J. I. Hamaker, and Messrs. R. W. Hall, A. S. Hanna, and B. S. Oppenheimer served as Sub-Assistants in the laboratory work.

In Zoölogy 3, the plan of allowing six weeks for the special-topic work, as in 1894–95, was continued. It is believed that this plan of special topics has a distinct advantage over that which made the laboratory instruction consist wholly of prescribed routine work. It is of course at the cost of a certain amount of detailed information, but the additional experience offered by this plan, and the greater stimulus to individual effort, more than compensate for this loss. The results obtained in the study of two of the topics assigned are deemed worthy of publication, and will be published under the following titles: "The Brachial and Lumbosacral Plexuses in Necturus," by F. C. Waite, and "The Azygos Veins in Swine," by C. H. Tozier. In conducting this course Dr. Parker had the assistance in the laboratory of Messrs. P. E. Sargent and W. L. Tower. Two short papers on the use of Formol, prepared last year by Dr. Parker, in collaboration with Mr. R. Floyd, have been published as Nos. LI. and LIV. of the Contributions.

The lectures in Zoölogy 4, by Dr. Mark, covered about the same ground as usual, and were supplemented by additional lectures given by Dr. Woodworth, who also had charge of the laboratory work. The class being a little smaller than in the previous year, it was not found necessary to seat the students in different rooms; but the facilities for laboratory work are insufficient even for the number of students taking the course the past year.

Dr. Woodworth, owing to the exceptional opportunity offered him of accompanying the Curator of the Museum in an expedition to Australia, was released from his duties in connection with the laboratory work of Zoölogy 5 at the end of February, and Mr. H. V. Neal was employed to take his place. The lectures and laboratory work were nearly the same as in previous years.

The lectures in Zoölogy 6, by Dr. Davenport, were devoted to ontogenetic problems during the first half-year, to phylogenetic ones during the second. The laboratory work had to be conducted under the great disadvantage of being in different rooms, and often at tables where the student was carrying on other studies; for the laboratory in the basement, though well adapted to certain work, is not a suitable place in which to conduct many of the experiments.

Of the several topics investigated, two have been completed ready for publication: (1) "On the Determination of the Direction and Rate of Movement of Organisms by Light. By C. B. Davenport and W. B. Cannon." (2) "Variation in the Markings on the Thorax of Doryphora decemlineata, and their Experimental Production. By W. L. Tower." A paper prepared by Dr. Davenport last year, in conjunction with Mr. Neal, has been published as No. LIII. of the Contributions.

Next to a permanent laboratory, the most pressing need in connection with this course is additional expensive apparatus for the measurement of the intensity of the physical agents used in experimental work.

In accordance with the statement made in the last Report, Zoölogy 7, by Dr. Parker, was so modified as to make the ground covered in two successive years different. During the past year the brief introduction to the study of the nervous system was followed by an extended discussion of the Anatomy and Physiology of Sense Organs. Laboratory work in connection with this course is desirable, and it is hoped that provision for it can be made as soon as the Department has at command the necessary room.

Following out the plan proposed in the Report of last year, Zoölogy 6 and 7 have been enlarged, the former into two courses, the latter into two half-courses. In both instances the work in alternate years will be different, so that the change practically amounts to offering to students one and a half additional courses in Zoölogy. It has been decided to make in connection with this change an alteration in the numbering of the courses involved, so that for the present Zoölogy 6 and Zoölogy 7 disappear from the annual announcement, and in their stead occur respectively the courses numbered 10 and 11, and 15 and 16.

The work of the students in Zoölogy 20*a* was highly creditable, and as an outcome a considerable number of papers have been well advanced or completed for publication. Some of these have been preliminary notices, the nature of the subjects being such that a prompt announcement of the chief results seemed desirable.

The degree of Doctor of Philosophy was conferred at the last Commencement upon two candidates in Zoölogy, Mr. Herbert S.

Jennings and Mr. Herbert V. Neal. The titles of their theses appear in the list of forthcoming Contributions from the Zoölogical Laboratory. The thesis of a candidate for the degree of Doctor of Science, Mr. Alfred G. Mayer, was received and approved, and Mr. Mayer was granted leave of absence from the end of February to the close of the College year, in order that he might accept the invitation of the Curator of the Museum to accompany him in his expedition to Australia. Mr. Mayer's thesis, No. LIX. of the Contributions, has already been printed in the Bull. Mus. Comp. Zoöl., Vol. XXIX. No. 5.

Doctors Jennings and Neal are to continue their zoölogical studies in Germany, the former as holder of a Parker Fellowship from this University, and Mr. Mayer holds the position of Assistant in the Museum in charge of Echinoderms, Polyps, etc.

The degree of A. M. was conferred on four students whose work was chiefly in the Department of Zoölogy.

The generous action of the Corporation of the University in appropriating a sum of money, and the liberality of the Curator of the Museum, have again made it possible to continue the publication of the more important Contributions from the Zoölogical Laboratory, of which the following twenty numbers have appeared since my last Report: —

L. DAVENPORT, C. B. — Studies in Morphogenesis, IV. — A Preliminary Catalogue of the Processes concerned in Ontogeny. Bull. Mus. Comp. Zoöl., Vol. XXVII. No. 6, pp. 171–199. 31 Figs. in text. November, 1895.

LI. PARKER, G. H., AND FLOYD, R. — The Preservation of Mammalian Brains by Means of Formol and Alcohol. Anatomischer Anzeiger, Bd. XI. No. 5, pp. 156–158. September 28, 1895.

LII. CASTLE, W. E. — The Early Embryology of Ciona intestinalis, Flemming (L.). Bull. Mus. Comp. Zoöl., Vol. XXVII. No. 7, pp. 201–280. 13 Pls. January, 1896.

LIII. DAVENPORT, C. B., AND NEAL, H. V. — Studies in Morphogenesis, V. — On the Acclimatization of Organisms to Poisonous Chemical Substances. Archiv für Entwickelungsmechanik der Organismen, Bd. II. Heft 4, pp. 564–583. 3 Figs. January 28, 1896.

LIV. PARKER, G. H., AND FLOYD, R. — Formaldehyde, Formol, Formalin, and Formalose. Anatomischer Anzeiger, Bd. XI. Nos. 18, 19, pp. 567, 568. February 14, 1896.

LV. PARKER, G. H. — The Reactions of Metridium to Food and other

Substances. Bull. Mus. Comp. Zoöl., Vol. XXIX. No. 2, pp. 105–119. March, 1896.

LVI. GEROULD, J. H. — The Anatomy and Histology of Caudina arenata Gould. Proc. Bost. Soc. Nat. Hist., Vol. XXVII. pp. 7–74. 8 Pls. April, 1896. *Also* Bull. Mus. Comp. Zoöl., Vol. XXIX. No. 3, pp. 121–190. 6 Pls. April, 1896.

LVII. PARKER, G. H. — Variations in the Vertebral Column of Necturus. Anatomischer Anzeiger, Bd. XI. Nos. 23, 24, pp. 711–717. 2 Figs. March 27, 1896.

LVIII. WILCOX, E. V. — Further Studies on the Spermatogenesis of Caloptenus femur-rubrum. Bull. Mus. Comp. Zoöl., Vol. XXIX. No. 4, pp. 191–206. 3 Pls. June, 1896.

LIX. MAYER, A. G. — The Development of the Wing Scales and their Pigment in Butterflies and Moths. Bull. Mus. Comp. Zoöl., Vol. XXIX. No. 5, pp. 207–237. 7 Pls. June, 1896.

LX. FOLSOM, J. W. — Neelus murinus, representing a new Thysanuran Family. Psyche, Vol. VII, No. 242, pp. 391, 392, Pl. 8. June, 1896.

LXI. GOTO, S. — Vorläufige Mittheilung über die Entwicklung des Seesternes, Asterias pallida. Zool. Anzeiger, Bd. XIX. No. 505, pp. 271–274. June 15, 1896.

LXII. PARKER, G. H. — Pigment Migration in the Eyes of Palæmonetes. A Preliminary Notice. Zool. Anzeiger, Bd. XIX. No. 506, pp. 281–284. 2 Figs. June 29, 1896.

LXIII. WOODWORTH, W. MCM. — Preliminary Report on Collections of Turbellaria from Lake St. Clair and Charlevoix, Michigan. Bull. Michigan Fish Commission, No. 6, pp. 94, 95. 1896.

LXIV. GOTO, S. — Preliminary Notes on the Embryology of the Starfish, Asterias pallida. Proc. Amer. Acad. Arts and Sci., Vol. XXXI. pp. 333–335. July, 1896.

LXV. WOODWORTH, W. MCM. — Report on the Turbellaria collected by the Michigan State Fish Commission during the Summers of 1893 and 1894. Bull. Mus. Comp. Zoöl., Vol. XXIX. No. 6, pp. 237–244. 1 Pl. June, 1896.

LXVI. TOWER, W. L. — On the Nervous System of Cestodes. Zoöl. Anzeiger, Bd. XIX. No. 508, pp. 323–327. 2 Figs. July 20, 1896.

LXVII. DAVENPORT, GERTRUDE C. — The Primitive Streak and Notochordal Canal in Chelonia. Radcliffe College Monographs, No. 8. 54 pp. 11 Pls. Boston, Ginn & Co., [Aug.] 1896.

LXVIII. LEWIS, MARGARET. — Centrosome and Sphere in Certain of the Nerve Cells of an Invertebrate. Anat. Anzeiger, Bd. XII. Nos. 12, 13, pp. 291–299. 8 Figs. Aug., 1896.

LXIX. **Judd, Sylvester D.** — Descriptions of three Species of Sand Fleas (Amphipods) collected at Newport, Rhode Island. Proc. U. S. Nat. Mus., Vol. XVIII. No. 1084, pp. 593–603. 11 Figs. Aug., 1896.

The money for the publication of the paper by Mrs. G. C. Davenport was provided by Radcliffe College.

Besides the foregoing there are already in hand the following Contributions, some of which will appear before this Report is in print: —

LXX. **Jennings, H. S.** — The early Development of Asplanchna Herrickii de Guerne. A Contribution to Developmental Mechanics. Bull. Mus. Comp. Zoöl., Vol. XXIX. No. 1, pp. 1–117. 10 Pls. Oct., 1896.

LXXI. **Neal, H. V.** — A Summary of Studies on the Segmentation of the Nervous System in Squalus acanthias. A Preliminary Notice. Anat. Anzeiger, Bd. XII. No. 17, pp. 377–391. 6 Figs. Oct. 20, 1896.

Brewster, E. T. — A Measure of Variability and the Relation of Individual Variations to Specific Differences. Proc. Bost. Soc. Nat. Hist., Vol. XXVII.

Mayer, A. G. — On the Color and Color Patterns of Moths and Butterflies. Bull. Mus. Comp. Zoöl., Vol. XXX.; *also* Proc. Bost. Soc. Nat. Hist., Vol. 27. 10 Pls.

Porter, J. F. — Two new Gregarinida. 2 Pls. Journal of Morphology.

Porter, J. F. — Trichonympha and other Parasites of Termes flavipes. 3 double plates. Bull. Mus. Comp. Zoöl.

Parker, G. H. — Photomechanical Changes in the Retinal Pigment Cells of Palæmonetes. 1 Pl. Bull. Mus. Comp. Zoöl.

Neal, H. V. — The Segmentation of the Nervous System in Squalus acanthias. 10 Plates.

Davenport, C. B. and Cannon, W. B. — On the Determination of the Direction and Rate of Movement of Organisms by Light. 1 Fig. Journ. of Physiol.

Davenport, C. B., and Bullard, C. — Studies in Morphogenesis, VI. — A Contribution to the Quantitative Study of Correlated Variation and the Comparative Variability of the Sexes. 1 Fig. Proc. Amer. Acad. Arts and Sci.

Owing to the illness of Professor Whitney, Dr. Mark was appointed during the latter part of the year temporary Chairman of the Division of Natural History, and Dr. Davenport was chosen Secretary of that body.

Besides the work done by Dr. Davenport in connection with the Contributions from the Laboratory, he has published in the "Educational Review" for May, 1896, a discussion on "Botany as an Alternative in College Admission Requirements," and has nearly completed Part First of a book on "Experimental Morphology," to be published by the Macmillan Company.

In addition to the papers by Dr. Parker, already enumerated in the Contributions, he has nearly finished an article on the "Arrangement of the Mesenteries in Metridium."

Dr. Woodworth has collaborated with the Curator of the Museum in a paper on "Some Variations in the Genus Eucope," which is to appear in the Studies from the Newport Marine Laboratory.

The translation of Part First of Korschelt und Heider's "Entwicklungsgeschichte der wirbellosen Thiere," by Drs. Mark and Woodworth, was published soon after my last Report.

The meetings of the Zoölogical Club have, as usual, been well attended by the instructors and advanced students.

All of the courses in Zoölogy given in Harvard were likewise given to students of Radcliffe College. There were in all 62 students, as follows: —

Zoöl.	1	10	Zoöl.	5	7
"	2	8	"	6	5
"	3	6	"	7	7
"	4	5	"	20*a*	4

The lectures have all been given at the Museum; but for want of necessary room the laboratory work in one of the courses, Zoölogy 3, was conducted elsewhere.

REPORT ON THE MAMMALS AND BIRDS.

By William Brewster.

Most of our collections of mounted Mammals and Birds were long since so nearly completed, — at least in the sense of filling the spaces available for their exhibition, — that of late there has been neither incentive nor opportunity to add much to them. The Europæo-Siberian Room has constituted an exception to this rule, but during the past year its collections have been augmented by the addition of several valuable Mammals, and no less than one hundred and fifty-four Birds. The Mammals are a Reindeer (*Rangifer tarandus*), a fine male Beaver (*Castor fiber*), a male Marmot (*Arctomys marmota*), and two Varying Hares (*Lepus variabilis*), representing the summer and winter pelages of the species. The Beaver was taken in Germany, the Marmot and Hares are from Switzerland. All of these specimens were purchased mounted of a dealer in Switzerland.

The Birds comprise eighty specimens from Japan, and seventy-four from various parts of Europe and Siberia. Of the latter, a Wall-Creeper (*Tichodroma muraria*), a Chough (*Fregilus graculus*), a Great Black Woodpecker (*Dryocopus martius*), two Three-toed Woodpeckers (*Picoides tridactylus*), a Pygmy Owl (*Glaucidium passerinum*), and a Coot (*Fulica atra*) were bought mounted of the Swiss dealer above referred to. The remaining European birds, as well as all of those from Japan, were mounted by J. T. Clark from skins taken from the Museum collections or furnished by Alan Owston of Yokohama. A pair of Red-cockaded Woodpeckers (*Dryobates borealis*), a Traill's Flycatcher (*Empidonax traillii*), and an Alder Flycatcher (*Empidonax traillii alnorum*) have also been mounted to fill gaps in the North American Faunal Room. The selection and identification of the skins, and the labelling and arrangement of the mounted birds after they were ready to be placed in the cases, have been done chiefly by Mr. Faxon, who, during my absence from Cambridge, has been kind enough to devote much of his time and attention to this part of the work.

In addition to the specimens just mentioned, the Museum has acquired during the past year the following. By gift, from Lieut. Wirt Robinson, U. S. A., skins (with the skulls) of a Bay Lynx (*Lynx rufus*), a Canada Porcupine (*Erethizon dorsatus*), and an Opossum (*Didelphys virginianus*); from Mr. Walter Faxon, mounted specimens of a Rose-breasted Grosbeak (*Habia ludoviciana*) — an adult male in a peculiar and very interesting autumnal plumage — shot at East Lexington, Massachusetts, September 14, 1895, and a young Virginia Rail from the same locality, taken September 17, 1895; from Mr. J. D. Sornborger, the skin of a Labrador Jay (*Perisoreus canadensis nigricapillus*), obtained in Labrador; from Mr. W. Brewster, a Florida Wild Turkey (*Meleagris gallopavo osceola*), taken at Fort Thompson, Florida. By purchase, a fine male Two-horned Rhinoceros (*Rhinoceros bicornis*) from Mashonaland, Africa, and a female Hedgehog Rat (*Aulacodus swinderianus*) from West Africa, both furnished mounted by H. A. Ward, — who has also mounted for the Museum a skeleton of the Florida Manatee (*Trichechus latirostris*).

I have published during the past year only the following article, which appeared in the "Auk": —

Descriptions of a New Warbler and a New Song Sparrow.

REPORT ON THE REPTILES AND FISHES.

By Samuel Garman.

The series of Deep-Sea Fishes from the Northern Pacific, secured by the steamer "Albatross" in 1890–91, sent by the United States Fishery Commission, forms the most important addition to these collections since the last Report. The list of species is large; the specimens arrived in excellent condition, and at an opportune moment for use in connection with studies of the fauna of the tropical Pacific. The Commission also furnished the Museum a large number of Fresh-Water Fishes from the basins of the Upper Missouri, the Maumee, and different rivers along the southeastern coast of the United States. Other collections were received from Messrs. Charles A. Parker and James Reed.

Among accessions to the Reptiles and Batrachians there are a fine lot of Floridan species sent by Outram Bangs, Esq., a number of handsome live Ophidia from Georgia by Prof. George E. Ladd of the United States Geological Survey, a considerable lot of Batrachians by Rev. Robert K. Smith, some desiderata collected in Central America by George B. Gordon, Esq., and representatives of various species contributed by Messrs. Wm. F. Clapp, M. A. Frazar, Frank W. Haven, and M. Reitz.

A collection of Reptiles and Batrachians was forwarded to Dr. Fernand Lataste, of Chili, as exchanges, and another, including certain Fishes and Selachians, to Prof. H. Garman of the State College of Kentucky.

The ichthyological work noted in the preceding Report has been continued; likewise the changes, rearrangements, and classification of the exhibition and storage collections. Aside from a number of unsigned articles in various publications, the following papers were published in the American Naturalist: "Sexual Rights and Lefts," and "Cross Fertilization and Sexual Rights and Lefts among Vertebrates."

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

By Samuel Henshaw.

Additions to the collections of the Department have been received from Miss Isabel Johnson, Messrs. A. L. Babcock, Outram Bangs, W. S. Bigelow, Frederick Blanchard, H. K. Burrison, S. C. Carpenter, T. D. A. Cockerell, W. G. Farlow, J. W. Folsom, G. B. Gordon, F. P. Gulliver, F. L. Harvey, Roland Hayward, Brainard Hooker, G. H. Horn, L. O. Howard, J. G. Jack, R. T. Jackson, F. C. Kenyon, A. D. Macgillivray, E. L. Mark, A. G. Mayer, A. P. Morse, E. A. C. Olive, Wirt Robinson, S. H. Scudder, M. V. Slingerland, L. W. Swett, Roland Thaxter, and E. V. Wilcox.

The Australian specimens generously given by Mr. Olive, together with those collected by Mr. Mayer, form the largest and most important addition received.

Material for study has been loaned to Messrs. W. H. Ashmead, William Beutenmüller, O. F. Cook, J. W. Folsom, W. J. Fox, Roland Hayward, L. O. Howard, A. D. Macgillivray, A. P. Morse, S. H. Scudder, and E. P. Van Duzee.

The use of the collection and of the library continues to increase, and attention to requests for information, identifications, etc., has increased the number of contributors, — a direct benefit to the Museum.

The collection, though not absolutely free from insect pests, is practically so.

A revisional rearrangement of (1) the Mutillidæ, Uroceridæ, and Tenthredinidæ of the Hymenoptera, (2) the Sesiidæ of the Lepidoptera Heterocera, (3) the Cicindelidæ, Buprestidæ, Cassidinæ, and Meloidæ of the Coleoptera, (4) the Cicadidæ of the Hemiptera Heteroptera, and (5) the Ixodidæ of the Arachnida, has been completed. Considerable portions of the Carabidæ, Scarabæidæ, and Tenebrionidæ of the Coleoptera have also been revised.

The specimens illustrating the Europæo-Siberian fauna, which have been on exhibition since 1885–86, have been replaced by a new series, representing more than double the number of forms previously shown.

REPORT ON THE CRUSTACEA AND MOLLUSCA.

By Walter Faxon.

A valuable lot of fresh-water Crustacea from Arkansas, Texas, and the Indian Territory has been given to the Museum by Professor S. E. Meek. Acknowledgments of gifts of specimens are also due to Mr. Ralph Hoffmann and to Professor D. W. Thompson, of University College, Dundee. Other important accessions are the result of exchanges carried on with the United States National Museum.

The Stalk-eyed Crustacea of the "Albatross" Expedition of 1891 have been divided between this Museum and the National Museum. A first set, comprising types of all the species, has been retained for our Museum, while the rest, including the larger part of the duplicates, have been sent to Washington. The large collections of Crayfishes that have accumulated in this Museum as well as in the National Museum during the last six years have been worked up by me, and the results embodied in a paper illustrated by nine plates, to be published in the Proceedings of the National Museum. A considerable collection of deep-sea Crustacea obtained by the "Blake" in 1877–79 — composed in part of duplicates reserved when the bulk of the collection was sent to Professor Alphonse Milne Edwards, in Paris, in part of specimens returned by him unused — has also been determined and catalogued. This collection revealed several new and interesting forms of deep-sea Crustacea, and added something to our knowledge of the distribution of many species already known.

I am happy to report that all of the deep-sea Crustacea in this Museum, the rich booty secured during the cruises of the "Bibb," "Hassler," "Blake," and "Albatross," are now — with the exception of the "Albatross" Cirripeds and Isopods, which are still in the hands of Dr. Hansen, of Copenhagen — identified and catalogued, and thus made available to workers in this important field.

Among the more valuable gifts to the department of Mollusca are a lot of shells from the west coast of the United States and Mexico, made over to the Museum by Professor J. D. Whitney a short time before his death, and a small but valuable collection from the Persian Gulf and the neighborhood of Bombay, presented by Mr. F. W. Townsend. The Reverend R. K. Smith, of Woburn, Mass., and Mr. R. Clapp, of Cambridge, have deposited in the Museum the first instalment of a special collection of New England shells. Rather curiously, the Museum collection is particularly weak in material from New England. Mr. Smith and his coadjutor have been at great pains to collect a fine series of each species, selecting specimens with a view to showing individual variations and the changes induced by growth. This collection, when completed according to the design of the donors, will form an invaluable aid to the student of our local fauna. Mr. Temple Prime has lately given to the Museum his valuable collection of Corbiculidæ (Cyrenidæ), answering to his printed catalogue of 202 species, and rich in types.

By purchase, a set of beautifully preserved Pteropod shells has been got from Mr. G. B. Sowerby, of London, and from Mr. C. J. Maynard a series of the Bahama Cerions (Strophias) that form the subject of his "Monograph of the Genus Strophia." Last winter Mr. Maynard spent some time in the study of the Cerions in our old collection, particularly the Cuban forms. The results of this investigation were published, as a continuation of the "Monograph of Strophia," in Maynard's "Contributions to Science," Vol. III. No. 1, pp. 1–40, Pls. I.–VII., March, 1896.

REPORT ON VERMES.

By W. McM. Woodworth.

The work done on the Museum collections of Vermes was confined chiefly to the preparation and arrangement of specimens for exhibition. All of the material in the Atlantic and Synoptic Rooms has been relabelled and rearranged, and a number of jars have been added to these exhibits. Considerable progress has been made with the systematic exhibit, the chief additions being some fine preparations of several intestinal parasites of the Sheep and Hog, collected and presented by Mr. C. Bullard. A good beginning has been made in the arrangement of the general collections, in separating the determined material from the undetermined, and a systematic arrangement of the same.

The Chætognatha were sent to Mr. F. C. Conant for determination, and were returned by him with some additions to the collection. Thanks are also due to Dr. S. Goto for determining the ectoparasitic Trematodes, and to Prof. H. B. Ward for depositing in the Museum the Turbellaria collected by the Michigan State Fish Commission during 1893 and 1894, descriptions of which have been published in the Museum Bulletin.

The Assistant has deposited in the Museum his collection of Vermes, amounting to about one hundred bottles, and the Museum has also received from the Bureau of Animal Industry of the U. S. Department of Agriculture a small collection of parasites.

A card catalogue of the Vermes in the Museum collection is in course of preparation, and includes a generic list as well as a serial one.

The report on the Nemertines of the "Albatross" Expedition is well advanced, as is also a report on the Turbellaria of the Illinois State Survey.

The Assistant has published two papers on Turbellaria: see Contributions from the Zoölogical Laboratory, Nos. LXIII. and LXV.

REPORT ON THE DEPARTMENT OF VERTEBRATE PALÆONTOLOGY.

By Charles R. Eastman.

The work in this Department has been carried on in accordance with the lines laid down in the last Report. The greater part of the Assistant's time has been devoted to the care of the collections; incidentally a selection has been made of specimens to be placed on exhibition, and some attention has been given also to the detailed study of certain groups of fossil Fishes. The task of identifying, labelling, and cataloguing the collection has progressed uninterruptedly. As a record is kept of the transfer of each specimen from the study series to the Exhibition Rooms, or *vice versa*, the location of all catalogued material in the Museum is apparent from a mere inspection of the cards. A quantity of broken or oxidized specimens have been repaired, and numerous others have been put in readiness for exhibition.

The Mesozoic Exhibition Room having been placed in order during the winter, it was thrown open to the public in March. A suite of fossil Fishes and Amphibians will shortly be installed in the new Palæozoic Exhibition Room.

Some very notable additions have been made during the year. Certain interesting reptilian casts and one of Dinotherium were purchased in England, and the majority of them are now on exhibition. By its acquisition of the Whitney Collection the Museum was enriched with a large number of specimens possessing great intrinsic and historical value, many of them being types. No less than thirty-five boxes of fossils, besides twenty-five of minerals and books, were brought down from Northampton last fall, where they had been stored since the date of Professor Whitney's connection with the various State geological surveys. One box of Vertebrate fossils from California was accompanied by the manuscript determinations of Professor Leidy, but no description of the remains has ever been published.

The purchase of the Enniskillen and Worthen Collections also secured to the Museum some valuable material. The first named was sent in exchange by the Right Honorable the Earl of Enniskillen, of Florence Court, Ireland, to Professor A. H. Worthen in 1865; it is accompanied by a complete list of specimens. The Worthen Collection of fossil Fishes from Illinois admirably supplements the Wachsmuth and St. John collections from adjoining States. Lastly, some important material was acquired by the Assistant during a recent visit to Western New York and Ohio, where negotiations were opened for further additions. Excellent opportunities were enjoyed on this trip for the study of the principal fossiliferous horizons, as well as public and private collections.

Additions to the Collection during the Year.

1895. Casts of *Pareisaurus Baini*, *Cetiosaurus Oxoniensis*, *Dodo ineptus*, *Dinotherium giganteum*, and various other casts, principally of fossil reptiles. Purchased. Received September 10, 1895.

1896. Whitney Collection. A large and valuable collection of fossils, principally Invertebrates, accumulated by the late Prof. J. D. Whitney during his connection with the Wisconsin, Iowa, and California State Geological Surveys. Includes many types and figured specimens, also some rare forms from Central and South America. Presented by Professor Whitney, January 1, 1896.

1896. Enniskillen Collection. An interesting series of fossil Fishes from the Carboniferous Limestone of Armagh, Ireland, and Bristol, England, with original MS. catalogue. Purchased of the heirs of Prof. A. H. Worthen, and presented to the Museum through the Assistant. Received February 28, 1896.

1896. *Elephas primigenius.* An excellent molar tooth of large size, found at the Pebble Phosphate Company's works, Marvinia, Florida, and presented to the Museum by Mr. J. Evarts Merrill of Jacksonville, Florida. Received June 4, 1896.

1896. Clark Collection. Interesting specimens of *Dinichthys*, *Cladodus*, *Mazodus*, and other genera of Devonian Fishes from Ohio. Purchased of Dr. William Clark, Berea, Ohio. Received September 15, 1896.

1896. Worthen Collection. An especially fine series of fossil Fishes, forming part of the private collection of the late Prof. A. H. Worthen. Purchased of Mr. T. A. Worthen, Warsaw, Illinois. Received September 16, 1896.

Papers published during the Year.

Remarks on Petalodus alleghaniensis Leidy (Journal of Geology, Vol. IV. pp. 174–176), March, 1896.

Review of Unter-Tertiäre Selachier aus Süd-Russland, by Dr. Otto Jaekel (Amer. Geol., Vol. XVII. pp. 245–247), April, 1896.

Preliminary Note on the Relations of Certain Body-plates in the Dinichthyids (Amer. Jour. Sci., Vol. II. pp. 46–50), July, 1896.

Textbook of Palæontology. Translated and edited from the German of Prof. Karl A. von Zittel. Vol. I. Part I. Protozoa to Mollusca. August, 1896.

Observations on the Dorsal Shield in the Dinichthyids. Read before the Amer. Assoc. Adv. Sci., August 26, 1896. (Abstract in Amer. Geol., Vol. XVIII. pp. 222, 223), October, 1896.

Review of paper On the Vertebral Column, Fins, and Ventral Armoring of Dinichthys, by Dr. Bashford Dean (Amer. Geol., Vol. XVIII. pp. 316, 317), November, 1896.

REPORT ON THE FOSSIL INVERTEBRATES.

By Alpheus Hyatt.

The Ammonitinæ of the Inferior Oölite have been carefully studied and relabelled, to accord with the publications of S. S. Buckman, whose extensive researches on the fossils of this formation in England have made this revision very desirable.

Researches upon the remarkable and ill understood group of Cretaceous Ammonitinæ of the Bucheceratidæ have been begun, and are partially completed. During the summer vacation several weeks have been expended upon the revision of the Palæozoic Cephalopods preparatory to the picking out of sets for exhibition in the Stratigraphic Collection.

The Department is indebted to R. T. Jackson for selecting materials for exhibition in the Stratigraphic Collection from the fossil Sponges, Hydroids and Corals. The collection of Crinoids has been consulted by Mr. Frank Springer. A paper "On the Validity of the Family Bohemillidæ Barrande," Am. Geol., Vol. XVII. pp. 360–362, 1896, has been published by Prof. C. E. Beecher of Yale University, based on the materials studied last year by him.

Forty-seven Palæozoic Starfishes have been loaned to Mr. Charles Schuchert of the National Museum for study.

Four specimens of Palæozoic Echini have been received from Dr. R. T. Jackson.

A small but valuable collection of Silurian Sponges and some Tertiary Fossils from Texas have been purchased from Henry A. Ward, of Rochester.

A small collection of Tertiary Corbiculidæ have been transferred to this Department from the Temple Prime Collection.

The following papers have been published: —

"Lost Characteristics," by Alpheus Hyatt. American Naturalist, January, 1896, pp. 9–17.

"The Meaning of Metamorphosis," by the same. Natural Science, Vol. VIII. No 52, June, 1896, pp. 395–403.

"The Development of Oligoporus," by R. T. Jackson. Science, II., November, 1895.

"Studies of Melonites multiporus," by the same and T. A. Jaggar, Jr. Bull. Geol. Soc. America, Vol. VII. pp. 135–170.

"Studies of Palæechinoidea," by R. T. Jackson. Ibid., Vol. VII. pp. 171–254, Plates II. to IX.

REPORT ON THE LIBRARY.

By Miss F. M. Slack.

During the year ending September 1, 1896, the Library has received 573 volumes, 2,134 parts, and 118 pamphlets.

	VOLUMES.	PARTS.	PAMPHLETS.
Gift	35	81	17
Exchange	224	963	72
Purchase	37	258	0
A. Agassiz	78	832	29
Binding Parts	199	0	0
	573	2,134	118

The number of volumes now in the Library (exclusive of pamphlets and the Whitney Library) is 22,744. There are 16,735 pamphlets bound in 2,811 volumes, making the total number of volumes 25,555.

To this should be added the Whitney Library, containing about 5,000 volumes and 1,500 pamphlets, making the total volumes 30,555, and about 1,800 pamphlets not yet arranged by subjects for binding.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE ACADEMIC YEAR 1895-96.

Of the Bulletin: —

Vol. XXVII.

No. 5. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "ALBATROSS," in charge of Alexander Agassiz. XIX. Die OSTRACODEN. Von G. W. MÜLLER. pp. 16. 3 Plates. October, 1895.

No. 6. STUDIES in MORPHOGENESIS. IV. A Preliminary Catalogue of the PROCESSES concerned in ONTOGENY. By C. B. DAVENPORT. pp. 28. November, 1895.

No. 7. The Early EMBRYOLOGY of CIONA INTESTINALIS Fleming (L.). By W. E. CASTLE. pp. 78. 13 Plates. January, 1896.

[Vol. XXVII. *is complete.*]

Vol. XXIX. (March-June, 1896.)

No. 1. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "ALBATROSS," in charge of Alexander Agassiz. XX. The FORAMINIFERA. By Axel Goës. pp. 104. 9 Plates and Chart. March, 1896.

No. 2. Contributions from the Zoölogical Laboratory. LV. The REACTIONS of METRIDIUM to Food and other Substances. By G. H. PARKER. pp. 14. March, 1896.

No. 3. Contributions from the Zoölogical Laboratory. LVI. The Anatomy and Histology of CAUDINA ARENATA GOULD. By J. H. GEROULD. pp. 68. 8 Plates. April, 1896.

No. 4. Contributions from the Zoölogical Laboratory. LVII. Further Studies on the SPERMATOGENESIS of CALOPTENUS FEMUR-RUBRUM. By E. V. WILCOX. pp. 12. 3 Plates. June, 1896.

No. 5. Contributions from the Zoölogical Laboratory. LIX. The DEVELOPMENT of the WING SCALES and their Pigment in BUTTERFLIES and MOTHS. By A. G. MAYER. pp. 28. 7 Plates. June, 1896.

No. 6. Contributions from the Zoölogical Laboratory. LXV. Report on the TURBELLARIA collected by the MICHIGAN STATE FISH COMMISSION during the Summers of 1893 and 1894. By W. McM. WOODWORTH. pp. 6. 1 Plate. June, 1896.

[Vol. XXIX. *is complete.*]

Of the Memoirs: —

Vol. XXII.

Reports on the Results of DREDGING under the supervision of ALEXANDER AGASSIZ in the GULF OF MEXICO (1877-78), in the CARIBBEAN SEA (1878-79), and along the ATLANTIC COAST of the UNITED STATES (1880), by the U. S. Coast Survey Steamer "BLAKE," Lieut. Com. C. D. SIGSBEE, U. S. N., and Com. J. R. BARTLETT, U. S. N., commanding. XXXVI. OCEANIC ICHTHYOLOGY, a Treatise on the DEEP SEA and PELAGIC FISHES of the World, based chiefly upon the Collections made by the Steamers "BLAKE," "ALBATROSS," and "FISH HAWK" in the NORTHWESTERN ATLANTIC. By GEORGE BROWN GOODE and TARLETON H. BEAN. pp. xxxvi + 26 + 553, and Atlas of 123 Plates. September, 1896.

[Published in Connection with the National Museum and the Smithsonian Institution.]

[B]

INVESTED FUNDS OF THE MUSEUM.

IN THE HANDS OF THE TREASURER OF HARVARD COLLEGE, SEPT. 1, 1895.

Sturgis-Hooper Fund	$100,000.00
Gray Fund	50,000.00
Agassiz Memorial Fund	297,933.10
Teachers and Pupils Fund	7,594.01
Permanent Fund	117,469.34
Humboldt Fund	7,740.66
Virginia Barret Gibbs Fund	5,000.00
	$585,737.11

The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Curator. The accounts are annually examined by a committee of the Overseers. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts with vouchers to the payment of which the income is applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Virginia Barret Gibbs Scholarship Fund, of the value of $250, is assigned annually, with the approval of the Faculty of the Museum, at the recommendation of the Professors of Zoölogy and of Comparative Anatomy in Harvard University, "in supporting or assisting to support one or more students who have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy."

The income of the Humboldt Fund (about $300) can be applied for the benefit of one or more students of Natural History, either at the Museum, the Newport Marine Laboratory, the United States Fish Commission Station at Wood's Hole, or elsewhere.

Applications for the tables reserved for advanced Students at the Newport Marine Laboratory, and for the tables at the Wood's Hole Station, should be made to the Director of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

Mus. 120.20.6.1

With the Compliments of
Alexander Agassiz.

ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE,

FOR

1896-97.

CAMBRIDGE, U.S.A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1897.

Case Shelf

LIBRARY

OF THE

Peabody Museum of American Archæology and Ethnology

IN CONNECTION WITH HARVARD UNIVERSITY.

PRESENTED BY

A. Agassiz

Received Dec. 13. 1897.

Cambridge

ANNUAL REPORT

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1897.

MUS. 120.20.6, 1

Gift of
A. Agassiz
Rec. Dec. 13, 1897

FACULTY OF THE MUSEUM.

Faculty.

CHARLES W. ELIOT, *President.*

ALEXANDER AGASSIZ, *Curator.*	GEORGE L. GOODALE.
——— ———, *Secretary.*	HENRY P. WALCOTT.

Officers.

ALEXANDER AGASSIZ	*Director and Curator.*
——— ———	*Sturgis-Hooper Professor of Geology.*
NATHANIEL S. SHALER	*Professor of Geology.*
WILLIAM M. DAVIS	*Professor of Physical Geography*
EDWARD L. MARK	*Hersey Professor of Anatomy.*
HENRY L. SMYTH	*Assistant Professor of Mining.*

APPOINTED BY THE FACULTY OF THE MUSEUM.

WALTER FAXON	*Assistant in Charge.*
SAMUEL GARMAN	*Assistant in Herpetology and Ichthyology.*
WILLIAM BREWSTER	*Assistant in Ornithology and Mammalogy.*
ALPHEUS HYATT	*Assistant in Palæontology.*
SAMUEL HENSHAW	*Assistant in Entomology.*
W. McM. WOODWORTH	*Assistant in Charge of Vermes.*
ALFRED G. MAYER	*Assistant in Charge of Radiates.*
C. R. EASTMAN	*Assistant in Vertebrate Palæontology.*
MISS F. M. SLACK	*Librarian.*
MAGNUS WESTERGREN	*Artist.*

APPOINTED BY THE PRESIDENT AND FELLOWS.

R. T. JACKSON	*Instructor in Palæontology.*
C. B. DAVENPORT	*Instructor in Zoölogy.*
G. H. PARKER	*Instructor in Zoölogy.*
W. E. CASTLE	*Instructor in Anatomy and Embryology.*
R. DeC. WARD	*Instructor in Climatology.*
T. A. JAGGAR, Jr.	*Instructor in Geology.*
R. J. FORSYTHE	*Instructor in Metallurgy.*
J. B. WOODWORTH	*Instructor in Geology.*
F. C. WAITE	*Assistant in the Zoölogical Laboratories.*
S. R. WILLIAMS	*Assistant in the Zoölogical Laboratories.*
R. W. HALL	*Assistant in the Zoölogical Laboratories.*
G. C. CURTIS	*Assistant in the Geographical Laboratory.*
J. E. WOODMAN	*Assistant in Geology.*
J. M. BOUTWELL	*Assistant in Physical Geography.*
C. H. WHITE	*Assistant in the Geological Laboratories.*

REPORT.

To the President and Fellows of Harvard College:—

During the past year the usual courses of instruction have been given at the Museum in the Natural History Laboratories. Those in Zoölogy were given by Professor Mark, and Doctors Davenport, Parker, and W. McM. Woodworth, assisted in the Laboratory work by Messrs. Henry R. Linville, John I. Hamaker, and J. H. Hathaway.

Professors Shaler and Davis, together with Instructors Robert Tracy Jackson, R. DeCourcey Ward, T. A. Jaggar, Jr., and J. B. Woodworth, gave courses of instruction in Geology, Palæontology, Physical Geography, and Meteorology. The Assistants in these departments were Messrs. Vernon F. Marsters, J. E. Woodman, and George C. Curtis.

The courses in Petrography and in Mining Geology, and allied subjects, are now given in the Mineralogical Department. These courses are in charge of Professor Wolff and Professor H. L. Smyth.

For the details of these courses of instruction, as well as of the summer courses in Geology, I would refer to the accompanying special reports of the Professors and Instructors.

I would specially call attention to the report of Professor Davis on the results of the teaching of Physical Geography during the summer courses.

The Newport Marine Laboratory has, as usual, been open to advanced students in Zoölogy. Eleven students spent a part of their time in the Laboratory collecting material for their special investigations, which they will continue and prepare for publication in Professor Mark's Laboratory at the Museum. I regret that hereafter it will be impracticable for me to open the Newport Laboratory to the students of the Zoölogical Department, as has been done for the past twenty years. I have during that time accumulated a large amount of material relating to the Marine Fauna of Narragansett Bay, which should be prepared for publication. The available room of the Laboratory will be required by the special Assistants who will aid me in this work, so that some other arrangement must be made to provide the facilities formerly furnished at Newport.

The Museum will now have at its command, for the use of its Assistants or other persons, the two tables at the Laboratory of the United States Fish Commission at Wood's Hole, to which it is entitled as one of the subscribers to the fund to establish the Commission Laboratory at Wood's Hole. One of the Museum Assistants and one student were admitted this year by Commander Brice to the Laboratory of the United States Fish Commission. The income of the Virginia Barret Gibbs Scholarship was assigned according to the terms of the gift.

Professor Faxon reports that he has completed the arrangement of the collection of recent Mollusca, undertaken in 1893. The collection of dried shells is now easily accessible, and in a state of permanent safety. It is contained in over 1,700 large standard wooden trays, and the bottles of the alcoholic collection, independently of the larger specimens contained in copper cans, fill about 100 trays. This of course does not include the Faunal or Systematic series of mounted specimens in the Exhibition Rooms.

Messrs. Henshaw, Garman, and Brewster report that the collections in their care are in excellent condition. Mr. Henshaw has devoted his time to the rearrangement of certain parts of our entomological collection, and to assisting those persons who have had occasion to consult the collection. He has also prepared for exhibition a collection of Galls, which has been placed in the Botanical Section of the Museum. In his report will be found a list of the additions to the Entomological Department.

The Exhibition Rooms have remained much as they were at the time of the last Report. A few specimens have here and there been intercalated to supply deficiencies, and poor specimens have been eliminated or better mounted.

Dr. Woodworth has been making some experiments with a view to improving the exhibition of alcoholic specimens. It is hoped to begin with the Synoptic and Atlantic Rooms, and substitute more artistically mounted alcoholic specimens for those now on exhibition.

To Professor Hyatt and to Mr. William Brewster the Museum is indebted for the care of their respective departments. Dr. R. T. Jackson has made excellent progress in the selection of the Fossils intended for the Palæozoic Exhibition Room.

Dr. Eastman has continued in charge of the Vertebrate Palæontological Collection, which is now in excellent order; he has devoted his time principally to the study and increase of the collection of Fossil Fishes, and has made several excursions to interesting localities on behalf of our collection.

Dr. Mayer has spent the greater part of the last six months in collecting material for the new edition of the North American Acalephs. More than thirty new species of Jellyfishes were collected at the Tortugas. In the early spring he spent some time at Newport and at Nahant to obtain those species which disappear with the early summer. He also visited the coast of Maine to collect the more northern forms. It will require at least two years to collect the more common species along our Atlantic coast, and an off-shore expedition from the Tortugas to Eastport will be needed, in addition to extended visits at other points of the Atlantic coast, before we can expect to bring together a fair representation of the Acalephan Fauna of our Atlantic coast. Dr. Mayer has also revised the labels of the alcoholic collection of Deep-Sea Corals, many of which had become faded.

Dr. Woodworth, who has been engaged in the revision of our collection of Worms, has undertaken to work up the Annelids of the Atlantic coast of the United States. The Museum is in possession of a large collection of colored drawings of species made by Professor Agassiz and his assistants, extending from the coast of Massachusetts to Florida. Of many of the species no specimens are extant, and it is hoped that some use may now be made of this valuable systematic material, which has been awaiting publication for so many years. During the past summer Dr. Woodworth has spent his time at the Newport Laboratory collecting the species of Narragansett Bay.

Collections have been sent in exchange to Professor Orton and to the Smithsonian Institution.

Specimens have been sent for examination to Mr. P. F. Kendall, to Mr. Gamble, to Dr. Thiele, and to Dr. Montgomery, who has prepared a report on the Gordiacea of the Museum Collection, together with the results of his preliminary examination on other collections of the group accessible to him. His report will appear in one of the forthcoming Bulletins, and will be illustrated by 15 Plates.

Among the principal collections we have received I may mention a collection of Devonian fish remains from Professor S. Calvin, State Geologist of Iowa; a collection of Worms, kindly sent from Sydney by Dr. Collingwood; and a valuable invoice of South American Fishes and Reptiles, from Dr. Lataste. The large collection of Corals from the northern part of the Great Barrier Reef made for me by Professor H. A. Ward has safely arrived at the Museum. This fine collection was made under considerable difficulties by Professor Ward, but to his perseverance and enthusiasm we owe one of the best possible representations of the species of reef builders of the northeast coast of Australia. In due time the collection will be placed on exhibition in the Systematic Room of Polyps.

We have also received a valuable collection of North Atlantic Crustacea from Canon Norman.

The Museum is likewise indebted to Messrs. Dendy, Jameson, and Hallez, for valuable additions to our collection of Turbellaria, Planarians, and Nemerteans.

We have also received a valuable collection of Mammals and Birds from Borneo and the Celebes, presented to the Museum by Dr. W. H. Furness.

The additions to the Library by purchase, gift, and exchange have kept up with those of the preceding year.

The Library now numbers, including the Whitney Library, over 31,000 volumes, and about 2,000 pamphlets which are not yet arranged for binding.

For a complete list of the publications of the Museum during the past year I refer to Appendix A. A list of the publications of the Officers and Instructors of the Museum other than those contained in our Memoirs and Bulletins will be found accompanying the special Reports.

Excellent progress is making with several of the Reports on the "Albatross" Expedition of 1891 since the last Report. Mr. Westergren has been engaged upon the Plates of Mr. Garman's Monograph of the Fishes.

Professor Lütken reports that he has completed the examination of the Ophiurans.

Professor H. B. Ward has also completed his Report on the Sipunculids, and Dr. Hansen that on the Isopods.

The proofs of the Report on the Acalephs have been sent to Dr. Maas, and it is hoped that his Memoir will be issued shortly.

Of the "Blake" Reports, we have published the Memoir by Professors Milne-Edwards and Bouvier on the Galatheidæ (Vol. XIX. No. 12), and a Bulletin (Vol. XXX. No. 3), Supplementary Notes on Crustacea, by Professor Faxon.

The Monograph on the American Crinoidea Camerata by Wachsmuth and Springer, by far the most extensive publication we have yet undertaken, has been issued by the Museum as Volumes XX. and XXI. of the Memoirs, accompanied by an Atlas of 83 Plates. The Heliotype Printing Company of Boston deserves great credit for the thorough manner in which it fulfilled its contract for the delivery of the Plates, and we are greatly indebted to Mr. Westergren for his endless care in the supervision of the presswork of the Plates.

The Corporation has continued the allowance of $400 made in previous years to aid in the publication of some of the Contributions from the Zoölogical Laboratory.

Of the Bulletins we published two numbers of the Geological Series relating to the Florida Reefs, by myself, Mr. L. S. Griswold, and Dr. E. O. Hovey (Vol. XXVIII. Nos. 2 and 3). Volume XXX. of the Bulletin has also been issued, containing four numbers of Contributions from the Zoölogical Laboratory, in charge ot Professor Mark, and one number by Dr. Woodworth and myself on the Variations in the Genus Eucope.

Among the papers which are ready for the press I may mention the report of my Visit to the Great Barrier Reef, and short papers by Dr. Woodworth on the Planarians, and by Dr. Mayer and myself on some Acalephs of the Barrier Reef.

A short Memoir on the Genus Dactylometra, by Dr. Mayer and myself, is also ready for the printer.

This publication will probably be delayed until my return from the Fiji Islands, where I have planned to pass the greater part of next winter in studying the coral reefs of that group. I shall be accompanied by Dr. Woodworth and Dr. Mayer as assistants. The steamer "Yaralla" has been chartered in Sydney for the expedition, and she is to meet us at Suva late in October. The outfit for the expedition has been shipped to Sydney to be placed on board the steamer we have chartered. In addition to the usual apparatus, for photographic purposes, for sounding and dredging, and for pelagic work, we take a diamond drill outfit, and hope to find a suitable locality for boring on the rim of one of the atolls of the Fijis. The boring machinery will be in charge of an expert sent by the Sullivan Machine Company, from whom this machinery was obtained. The Directors of the Bache Fund have made a large grant towards the expenses of this boring experiment.

I am also indebted to Professor Brandt of Kiel for superintending for me the construction of a deep-sea self-closing townet, such as was used in the "National" Expedition. Dr. Richard, of Paris, sent me a modified Giesbrecht net, such as is used by the Prince of Monaco on the "Princess Alice," and Dr. A. Dohrn kindly deputed Dr. Giesbrecht to send me one of the Giesbrecht nets from the Naples Station. These, together with the old and new styles of Tanner net, which we take with us, as well as a self-closing net adopted by Mr. Townsend of the "Albatross," which he was kind enough to have made for me, will give us the means of comparing these different styles of deep-sea townets, and of testing their comparative efficiency under similar circumstances.

Thanks to the kind offices of the State Department at Washington, we carry letters to the Governor of the Fijis from the Foreign Office in London.

I have to thank specially Admiral Wharton, R. N., Hydrographer of the Admiralty, for his assistance and counsel in regard to our visit to the islands, and also Captain W. O. Moore, R. N., for his kindness in placing at my disposal his experience and the information he acquired while surveying the Fijis. I must also mention the late Sir John B. Thurston, Governor General of the Fijis, who from the first conception of the expedition took the deepest interest in our success. We shall greatly miss his advice, and the knowledge he had gathered during the long period of his administration in that part of the South Sea Islands.

Mr. Theodore Lyman, one of the most efficient and devoted friends of the Museum, died at Nahant on the 9th of September, 1897. Withdrawn since 1885, by reason of failing health, from any active share in the affairs of the Museum, he nevertheless was and must ever remain identified with its history. The regret for his absence, always deeply felt by his colleagues, made a blank in their ranks which his death only accentuates. Not only did they value him for his personal acquirements, and for his sympathy with the general interests of the Museum, but also for his genial character, which brought with it a cordial, cheering influence appreciated by all his co-workers.

From his youth he was a favorite pupil of Professor Agassiz, and that relation, notwithstanding their difference of age, ripened into friendship with advancing years. He entered with zeal into all the plans of Professor Agassiz for the establisment of a Museum at Cambridge, and the creation of a school of Natural History at Harvard University. He was one of the original trustees of the Museum, and served as its Treasurer in addition to his work as Assistant in Zoölogy.

After the Charter of the Museum was transferred to the Corporation of Harvard University, he became a member of the Museum Faculty, and acted as its Secretary. In all these official positions his devotion to the founder of the Museum, his business capacity, his common sense and sound judgment, were of great value in raising the institution to its present position.

After the death of Professor Agassiz, Mr. Lyman continued his services to the Museum, until he became incapacitated for work by the disease which finally ended his life. His letter of resignation shows what it cost him to give up his scientific pursuits, and sever his connection with the institution to which he was so deeply attached. It signified also his full recognition of the ordeal he was called upon to face, and which he bore through years of suffering with invincible fortitude.

Mr. Lyman's scientific work was devoted to fisheries and to the study of Brittle Starfishes. As Fish Commissioner of Massachusetts he gave the State valuable service, and published a number of annual reports from 1866 to 1881.

His zoölogical work began with short papers on ornithological subjects; he subsequently became interested in corals, and finally devoted himself specially to Ophiurans. The first Illustrated Catalogue of the Museum was from his pen, and this important monograph on Ophiurans was followed by numerous papers on the same subject, treating of new species of the group. He wrote the Report on the Ophiurans of the "Hassler" Expedition, of the "Challenger," and of the "Blake" Reports, which include by far the larger number of species of Ophiurans dredged by those deep-sea exploring expeditions.

ALEXANDER AGASSIZ.

CAMBRIDGE, October 1, 1897.

REPORT ON THE COURSES OF INSTRUCTION IN GEOLOGY.

By Professor Shaler.

During the Academic year 1896–97, the following named courses of instruction were given in the laboratories and in the field by the instructors of the Department of Geology and Geography. It will be noted that certain courses formerly enumerated in this list no longer appear, having been incorporated in the new Department of Mineralogy and Petrography.

Instruction in General Geology.

(Geol. 4.) A half-course in Elementary Geology: two lectures a week by N. S. Shaler, with required reading in Dana's Manual of Geology. Assisted by J. E. Woodman. Other instructors in the Department gave lectures on particular phases of geology. The course was attended by three hundred and twenty students.

(Geol. 5.) A half-course in Elementary Field and Laboratory Work, requiring two-hour exercises twice a week during the laboratory season, and one half-day a week in the field during the spring months. This course was given by Mr. J. B. Woodworth, assisted by J. E. Woodman. It was attended by seventy-seven students.

(Geol. 8.) A course in General Critical Geology, two lectures a week, by J. B. Woodworth, assisted by J. E. Woodman. Field work in the spring and autumn; required reading and library work in the winter; attended by eighteen students.

(Geol. 22*a*.) A course in Geological Field and Laboratory Work, designed to afford special training in methods of investigation, conducted by T. A. Jaggar, Jr., under the supervision of the instructors of the Department. Attended by six students.

(Geol. 22*b*.) A course in geological investigation, intended to lead to results worthy of publication; under the direction of the instructors of the Department. Attended by one student.

(Geol. 16.) A half-course in Glacial Geology, by J. B. Woodworth. Two hours a week with field work. Attended by seven students.

(Geol. 17.) A course in Experimental and Dynamical Geology, by T. A. Jaggar, Jr. Two lectures a week with laboratory work. Attended by two students.

Instruction in Physical Geography and Meteorology.

(Geol. 2.) A half-course in Physiography, by W. M. Davis, assisted by V. F. Marsters. Two or three lectures a week, with laboratory work and recitations, first half-year. Attended by fifty-three students.

(Geol. 1.) A half-course in Elementary Meteorology, by R. DeC. Ward. Two or three lectures a week, with laboratory work and recitations, second half-year. Attended by ninety-nine students.

(Geol. 3.) A half-course in Physiography and Meteorology, by W. M. Davis and R. DeC. Ward. Two lectures a week. Attended by thirteen students.

(Geol. 6.) A half-course in the Physiography of the United States, by W. M. Davis. Lectures, library work, and reports, second half-year. Attended by seventeen students.

(Geol. 19.) A half-course in Climatology, by R. DeC. Ward. Three lectures a week, first half-year. Attended by twelve students.

(Geol. 20.) A course in advanced Physiography, by W. M. Davis. Conferences held once a week. Attended by five students.

Instruction in Palæontology.

(Geol. 14.) A half-course in Palæontology, by N. S. Shaler, assisted by R. T. Jackson. Two lectures a week, with theses. This course was attended by seventeen students.

(Geol. 13.) A course in Invertebrate Palæontology, by R. T. Jackson. Two lectures a week, with laboratory work. Attended by two students. This course will be discontinued; its place to be filled by a similar proposed course in the Zoölogical Department.

(Geol. 15.) A course in Historical Geology, designed to train advanced students in the use of fossils in determining geological horizons, by N. S. Shaler and R. T. Jackson. This course was taken by three students.

Instruction in the Summer Schools.

(Geol. S. 1.) An elementary course in General Geology, given in Cambridge, by Professor Shaler and Dr. G. E. Ladd. This course was attended by nineteen students.

(Geol. S. 2.) A course in Geological Field Work, by N. S. Shaler and J. B. Woodworth. After a week spent in Cambridge, the class went into the field in Southern New England, under the guidance of Mr. Woodworth. Attended by three students.

19. (Geog. 1.) A course in Elementary Physiography, beginning July 3, and lasting six weeks, by W. M. Davis, assisted by W. H. Snyder and M. H. Wright. Lectures, laboratory work, and excursions. Attended by seventy-eight students.

20. (Geog. 2.) A course in the Physiography of the United States, beginning July 3, and lasting six weeks, by W. M. Davis, assisted by J. M. Boutwell. Lectures, reports, and theses. Attended by eleven students.

The instruction in Elementary Geology was given in two half-courses, one a lecture course by Professor Shaler, with occasional lectures by other members of the department. Mr. J. E. Woodman acted as Assistant during the year. The remainder of the instruction in elementary geology was given in the form of a laboratory and field course by Mr. J. B. Woodworth, assisted by Mr. Woodman.

An advanced course in General Geology was given by Mr. Woodworth as in former years. The same instructor repeated his half-course in glacial geology, having particular relation to the glacial deposits in the eastern half of the United States. Field work was maintained in both of these courses. Mr. Woodworth reports a number of specimens added to the teaching collection for geological students and the placing of a show case in the Laboratory for the reception of materials which have been described in publications by the officers of the Department. It is hoped thus to preserve the specimens which have been made the basis of important conclusions.

During the year, Professor Shaler and Mr. Woodworth continued the examination of the Richmond coal field in Virginia, the costs of the investigation being defrayed by the United States Government. Professor Shaler has completed a report on the Geology of Cape Cod for the United States Geological Survey.

During July and August Mr. Woodman visited Central Nova Scotia, making investigations relating to the suitability of the region for advanced geological teaching, and to the structure of the rocks, the origin of the gold-bearing veins and their contents, and the general mining policy of the Province.

In the Summer Schools of the University, two courses in Geology were given under the direction of Professor Shaler. The first of these was an elementary course given in Cambridge, the immediate supervision of which in the laboratory and in the field was placed in the hands of Dr. G. E. Ladd, of the Geological Survey of Georgia, formerly an instructor in this Department. The second school was given for five weeks in the field, the time being devoted to an examination of the general geology of Southern New England. A detailed itinerary of the route taken has been published in the announcements of the Summer Schools for the year 1897. On these journeys materials were collected for the teaching collection of the Laboratory.

Specimens of fulgurite from the sand beach of Lighthouse Point, Marquette, Mich., were presented by Mr. H. W. Kidder.

Dr. R. T. Jackson reports that the collections used in teaching Palæontology are in good condition. Considerable additions have been made to the series of enlarged photographic diagrams, of which there are now eighty-five. Some excellent specimens of Cambrian Trilobites from British Columbia were received from Mr. F. N. Balch, of the Graduate School. A fine crinoid stem from the Chemung of Pennsylvania was received from Mr. C. O. Macfarlane, Superintendent, Long Valley Coal Co., Towanda, Pa. A number of desirable specimens were received from Mr. J. B. Woodworth, for all of which the Department records its thanks.

A good representation of the plants of the Dakota Group of Kansas was purchased of Mr. C. H. Sternberg, of Lawrence, Kansas. A number of fossils selected to fill gaps in the collection were purchased of Prof. H. A. Ward, of Rochester.

The collection of Invertebrate Fossils is now a very good one, embracing representative genera of all the groups which are preserved in the geological record. It includes many microscopic slides and other preparations to elucidate structural detail. The collection which illustrates Historical Geology is also satisfactory. While there is need of additional material in many groups, there is a considerable representation of fossils from every important geological horizon from the Lower Cambrian to the Quaternary.

Dr. Jackson spent considerable time in working on the Palæontological Collections of the Museum.

Mr. T. A. Jaggar, Jr. reports as follows concerning the advanced courses in geological field and laboratory work.

In Geology 22*a*, Messrs. Buckman and Kendall worked together on the stratigraphic relations of the sedimentary rocks about Hoppin Hill, near North Attleborough, Mass.

In Geology 17, Mr. V. F. Marsters, in collaboration with Mr. Jaggar, completed a preliminary series of experiments on the influence of rate of compression and initial fracture in deformation of strata. This half-course in experimental geology was given for the first time: a series of lectures extending throughout the first half-year reviewed the work of former experimenters, and systematic laboratory work covered experiments in deformation, delta deposition and sedimentation, ice motion, vortical motion of fluids and its geological work (ripple-mark, etc.), rock and mineral synthesis (including Moissan's experiment with the electric furnace). During the second half-year Mr. Marsters made a series of tests with various crucibles to determine the most effectual and inexpensive method of using the blast furnace for rock synthesis, and completed several syntheses of basalt.

The Gardner Collection of Photographs has been in the hands of a committee composed of Messrs. J. B. Woodworth, Ward, and Woodman.

A case has been provided for the reception of lantern slides, with a capacity of 3,500 slides. About one hundred slides have been added during the year, mainly reproduced from photographs already in the collection.

341 catalogued photographs have been added to the collection since the last Report, bringing the number up to 3,594. A few faded photographs have been condemned and thrown aside. The most notable additions during the year have been a number of views of the High Sierras taken by Mr. J. S. Solomons, of San Francisco; a set of Norwegian views selected by Dr. Hans Reusch, Director of the Geological Survey of Norway; a set of coastal views from Maine and Massachusetts, donated by Mr. John L. Gardner, Jr.; and a set acquired by purchase from the Iowa Geological Survey. Gifts were received from Mr. G. W. Griffith of a panorama of the Muir Glacier in Alaska, and from Mr. J. C. Clark of English views; also from Mr. J. H. Ropes, and from Mr. C. I. Wright.

REPORT ON COURSES IN PHYSICAL GEOGRAPHY.

By Professor W. M. Davis.

During the past year, the courses in Elementary and Advanced Physiography given by Professor Davis, and the course in Elementary Meteorology given by Mr. Ward, have been conducted on the plan described in recent reports. The course on Climatology by Mr. Ward in the first half-year was presented for the first time, and the course on the Physiography of the United States by Professor Davis in the second half-year was given for the second time after an interval of a year, in which a similar course was given on Europe. It is believed that the course on Climatology will prove to be a valuable addition to the preparation of those who later take up the study of medicine, as at present this important subject seldom finds adequate treatment in medical schools. The acceptance with which a series of four lectures on Climatology by Mr. Ward were received by an audience of physicians in Boston in the spring of 1897 gives further ground for this belief. The course on the United States was strengthened by a much more extended exhibition of reports and essays, bearing on the various divisions of the country than when it was given before: in this connection, Darton's Bibliography of American Geology (Bulletin 127, U. S. Geol. Survey) proved very serviceable.

Apart from the duties connected with courses of instruction, Mr. Ward undertook to inquire, by means of a circular letter addressed to medical schools, into the amount of attention given to Climatology in their regular course of study, with the result intimated above. In the latter part of the year, Mr. Ward gave much care to preparations for his voyage around South America, including visits to various ports, and a sojourn at the Harvard Observatory at Arequipa, Peru. He left New York on this voyage early in June, 1897, and will return to Cambridge in January, 1898. During the past year, Mr. Ward has prepared an Outline of

Requirements in Meteorology for the Committee on Admission Requirements, and has edited a series of "Current Notes on Meteorology" in Science. The chief additions to his laboratory collections are a series of Mercator wall maps of isotherms and isobars, enlarged from the maps in Buchan's Challenger Report for lecture use.

Ten years ago, a series of geographical models designed by Professor Davis was constructed with the aid of Mr. J. H. Emerton of Boston for use in one of the Lowell free lecture courses in the Teachers' School of Science of the Boston Society of Natural History. Several sets of these models, reproduced in paper by Mr. Emerton, were sold to colleges and schools. One set has been in constant use in the Geographical Laboratory of the Museum, and has been of great service; but it has been increasingly desirable in recent years to make a new series of models of greater accuracy, and on an improved plan. Hitherto, this has been impossible on account of the expense involved in securing the services of a competent modeller; but in the autumn of 1896, a fund of several hundred dollars was subscribed for this object by a number of ladies and gentlemen of Boston interested in educational problems, and a long cherished plan was put into execution. Among the subscribers to this fund, Miss Marian C. Jackson must be mentioned, as without her support the undertaking could not have reached its present measure of success. The services of Mr. George C. Curtis, recently a student of geology and geography in the Lawrence Scientific School, were secured in October, 1896, and in June, 1897, ten sets of three models each — or thirty models in all — had been constructed after original designs by Professor Davis: one model representing a deeply dissected mountainous region, descending to the sea; the second, including a coastal plain revealed on the border of the mountains in consequence of a regional elevation; the third exhibiting an irregular coast of promontories and bays, produced by a general depression of the first. An account of the models has been published in the Proceedings of the Boston Society of Natural History, and all the sets thus far constructed have been engaged by various Normal and other schools, although not at this date actually sold. It is hoped that it will be possible to continue this work during the coming year, with the double object of supplying schools with better materials for teaching geography, and inducing some enterprising publisher to undertake the duplication of such models in larger numbers and at low price. Eventually, it is desired to establish a Museum of Systematic Geography, in which an extended series of typical land forms shall be exhibited.

During the past year, Professor Davis has completed his long delayed Report on the Triassic Formation of Connecticut for the United States Geological Survey, and has made good advance in the preparation of a text book of Elementary Physiography. In connection with his service on the Committee on Admission Requirements, he has drawn up an Outline of Requirements in Physiography for the use of secondary schools. In order to extend the introduction of topographical maps in elementary teaching, he has written pamphlets on the use of the State Map in grammar schools, which have been published by the educational authorities in New York and Massachusetts, thus following the example set by Connecticut and Rhode Island a year ago. He has continued the editing of "Current Notes on Physiography" in Science, and with Mr. Ward has joined the board of associate editors of the Journal of School Geography, conducted by Professor R. E. Dodge, of the Teachers' College, New York City. In company with students, or alone, he has visited the Triassic region of Connecticut, the cuspate forelands of Narragansett Bay and Nantucket, and the peculiar coastal plain of Southern Maine. Late in June, he addressed the University Convocation at Albany, N. Y., on the Present Trend of Geography, and early in July he conducted a conference on Geography in the summer school connected with the University of Pennsylvania.

In the vacation, two courses on Geography were given by Professor Davis in the Harvard Summer School: a first course, on Elementary Physiography, in which he was assisted by Messrs. W. H. Snyder, Master in Science, Worcester Academy, and M. W. Wright, of the College class of '97; and a second course on the Physiography of the United States, in which he was assisted by Mr. J. M. Boutwell, '97. As in 1896, the time and effort given to summer teaching are fully repaid by the interest thus aroused among teachers in secondary schools. It is not too much to say that a greater effect is now produced on educational methods in geography through six weeks' work with actual teachers in the summer school than through the whole college year with undergraduates and graduates.

EXCURSIONS AND CONFERENCES.

The following excursions were offered in 1896-97, — several of them in co-operation with geologists from other New England colleges: —

Nahant, Mass.; Professor Shaler.
New Haven, Conn.; Professor Davis.
Hoosac Mountain, Mass.; Professor Wolff.
Coastal Plain of Southern Maine; Professor Davis.
Barrington Sandplain, R. I.; Mr. J. B. Woodworth.
Ipswich Dunes, Mass.; Mr. J. H. Sears, of Salem.
Meriden, Conn.; Professor Davis.
Franklin Furnace, N. J.; Professor Wolff.
Northampton, Mass.; Professor B. K. Emerson, of Amherst College.
The Narragansett Basin, R. I.; Mr. J. B. Woodworth.

The following subjects were discussed at the Geological Conference: —

The Eruptive Rocks of Sussex County, N. J.; Professor Wolff.
The excursion to the Coastal Plain of Southwestern Maine; Professor Davis.
The excursion to Hoosac Mountain (illustrated by stereopticon); Professor Wolff.
Some features of the Cornwallis Valley, N. S.; Mr. V. F. Marsters.
Exhibition of a new Goniometer; Dr. Charles Palache.
Note on the Hurricane of October 10-14; Mr. R. DeC. Ward.
An Instrument for inclining a Preparation in the Microscope; Mr. T. A. Jaggar.
The Geology of Nahant; Professor Shaler.
The Tourmalines of Mt. Mica, Maine; Dr. Charles Palache.
A remarkable Joint Specimen from Somerville, Mass.; Mr. J. B. Woodworth.
Material illustrating the Appendages of Trilobites; Dr. R. T. Jackson.
Magnetic Observations in Geological Mapping; Professor Smyth.
The Structure and Formation of Agates (illustrated by projection apparatus); Dr. W. S. Bigelow.
Geological History of the Cape Cod District; Professor Shaler.
The Deflective Force of the Earth's Rotation; Professor Davis.
Some Phenomena of Steel; Mr. R. J. Forsythe.
The Elæolite Syenite of the Serra Monchique in Portugal; Dr. F. L. Ransome.

The Influence of Initial Fracture and Rate of Compression in Mountain-building (illustrated by models); Mr. T. A. Jaggar.

The Elevated Reef of Florida; Mr. J. E. Woodman.

The Grain of Rocks; Dr. A. C. Lane.

A Proposed Classification in Anthropo-climatology; Mr. R. DeC. Ward.

The Wamsutta Group in the Narragansett Basin; Messrs. H. F. Kendall and G. Buckman.

The Dikes of the Richmond Basin; Mr. J. B. Woodworth.

The Anticlinal and Synclinal Ridges of Pennsylvania; Mr. A. P. Chittenden.

The Gold District of Clay County, Ala.; Professor Shaler.

Notes on the Origin of Petroleum; Mr. G. B. Richardson.

A Geographical Model; Mr. G. C. Curtis.

The Critical Temperatures of Steel; Mr. R. J. Forsythe.

Sandplain Growth in relation to Water Level; Mr. T. A. Jaggar.

The Turkey Branch Section of the Newark Rocks in the Richmond Basin; Mr. J. B. Woodworth.

Post-glacial History of the Connecticut River at Turner's Falls; Mr. M. S. W. Jefferson.

The Geological Aspects of the Narrative of Nansen's last Voyage; Professor Shaler.

Model of a Fjorded Coast; Mr. G. C. Curtis.

Glacial Phenomena, Past and Present, in Greenland, Baffin Land, and Labrador; Professor G. H. Barton.

Dr. Archibald Bruce, Pioneer in American Mineralogy; Professor Wolff.

Natural Coke from the Richmond Basin; Mr. G. B. Richardson.

Recent Studies on the Glacial Great Lakes; Professor Davis.

Greenland, the Arctic Island Continent (illustrated by stereopticon); Civil Engineer R. E. Peary, U. S. Navy.

A Proposed Scientific Trip to South America; Mr. R. DeC. Ward.

The Crystallization of Calcite; Dr. Charles Palache.

The Inclusion-bearing Basalts of the Boston Basin; Mr. T. A. Jaggar.

The Lewis and Clarke Expedition; Professor Wolff.

REPORT ON COURSES IN MINING GEOLOGY.

By Assistant Professor H. L. Smyth.

During the past year the course in Mining Geology (Geology 10) was given in the Mineralogical Section of the University Museum, continuing the arrangement of the preceding two years. It is expected that this course will eventually find permanent quarters in the Cary Building.

The lamented death of Professor Whitney in the summer of 1896 made necessary a rearrangement of the courses in Economic Geology. Geology 18 became a half-course in the first half-year, instead of a full course, and was devoted to the consideration of the non-metalliferous minerals. Professor Shaler undertook the greater part of the work of this course, Mr. Smyth dealing only with sulphur and the salts. It is proposed to continue this arrangement for the coming year. Professor Whitney's course in the Metals and Metalliferous Ores is represented by the parallel course Geology 10.

The collections in Economic Geology have received important accessions during the year from Butte, Cripple Creek, Mercur, Leadville, etc. Mr. Henning Jennings of Johannisberg has contributed an interesting and valuable collection of ores from the Witwaters Rand district in South Africa.

During the year much time was spent in preparing for publication the results of geological field work done in the Upper Peninsula of Michigan in 1891 and 1892. While the work itself was a private enterprise, an arrangement has been made whereby the results are to be published under the auspices of the Lake Superior Division of the United States Geological Survey. One instalment of the final paper is mentioned in the list of publications which follows.

PUBLICATIONS BY OFFICERS AND STUDENTS OF THE DEPARTMENT OF GEOLOGY AND GEOGRAPHY SINCE THE LAST REPORT.

By N. S. Shaler: —

1. The Glacial Brick Clays of Rhode Island and Southeastern Massachusetts. (With J. B. Woodworth and C. F. Marbut.) 17th Annual Report of the Director, U. S. Geological Survey, Part I., 1896, pp. 957–974, 999–1004.
2. Abstract of Administrative Report, for year 1895–96. 17th Annual Report of the Director, U. S. Geological Survey, Part I., 1896, p. 18.
3. Fourth Annual Report Massachusetts Highway Commission. (With Thos. C. Mendenhall and W. E. McClintock.)
4. Nansen's Heroic Journey. Atlantic Monthly, May, 1897, Vol. LXXIX. pp. 610–617.

By W. M. Davis: —

1. The State Map of New York as an Aid to the Study of Geography. University State of New York, Examination Bulletin No. 11, Nov., 1896, pp. 503–526.
2. The State Map of Massachusetts as an Aid to the Study of Geography in Grammar and High Schools. Boston, 1897.
3. The Harvard Geographical Models, with a Note on the Construction of the Models by G. C. Curtis. Proc. Boston Soc. Nat. Hist., Vol. XXVIII., 1897, pp. 85–110.
4. The Present Trend of Geography. Bull. University of the State of New York, 1897.
5. Current Notes on Physiography. Science (through the year).
6. Outline of Requirements in Physiography, 1897. Harvard University.
7. Outline of Requirements in Meteorology (with R. DeC. Ward), 1897. Harvard University, pp. 16.
8. Home Geography. Jour. School Geography, I., 1897, pp. 2–7. Translated in Zeitschr. f. Schulgeogr., XVIII., 1897, pp. 225–229.
9. The Use of Periodicals. Ibid., I., 1897, pp. 81–85.
10. The Temperate Zones. Ibid., I., 1897, pp. 139–143.
11. Topographic Maps of the United States. Ibid., I., 1807, pp. 200–204.
12. Notices of Geographical Publications relating to the United States (with J. M. Boutwell). Annales de Géogr., Bibliogr. de Géogr., Paris, 1897.

By H. L. Smyth:—

Magnetic Observations in Geological Mapping. Trans. Amer. Inst. M. E., XXVI., 1897.

By R. DeC. Ward:—

1. Outline of Requirements in Meteorology. (With W. M. Davis.) 1897, Harvard University, pp. 16.

2. Meteorological Observations in Schools. Jour. School Geography, Feb., 1897.

3. Current Notes on Meteorology. Science (through the year).

By J. B. Woodworth:—

1. The Retreat of the Ice-sheet in the Narragansett Bay Region. The Amer. Geol., Vol. XVIII., 1896, pp. 150–168, Map, Pl. VI.

2. The Ice-sheet in Glacial Narragansett Bay. Ibid., pp. 391, 392.

3. Charles Thomas Jackson. Ibid., Vol. XX., 1897, pp. 69–110. Portrait, Pl. IV. Bibliography, pp. 87–110.

4. On the Fracture System of Joints, with Remarks on certain great Fractures. Proc. Boston Soc. Nat. Hist., Vol. XXVII., 1896, pp. 169–183. 5 plates.

5. The Queen's River Moraine in Rhode Island. The Journ. Geol. (Chicago), Vol. IV., 1896, pp. 691–703. 7 figs. (With C. F. Marbut.)

6. Gibbers. Science, N. S., Vol. V., 1897, pp. 476, 477.

7. Unconformities of Martha's Vineyard and Block Island. Bull. Geol. Soc. Am., Vol. VIII., 1897, pp. 197–212. 1 map and 4 figs.

Abstract in the Journ. Geol. (Chicago), Vol. V., 1897, pp. 96, 97. Also Science, Vol. V., 1897, pp. 86, 87.

8. The Glacial Brick-clays of Rhode Island and Southeastern Massachusetts, by N. S. Shaler, J. B. Woodworth, and C. F. Marbut. Chap. II. Geology and Geography of the Clays. 17th Annual Report of the Director of the U. S. Geol. Survey, Pt. I., 1896, pp. 975–988. 1 map and figures.

9. The Clays about Boston (with C. F. Marbut). Ibid., Chap. III. pp. 989–998.

10. [Itinerary of a course of field work in Southeastern New England.] The Summer School. Harvard University, 1897. Pamphlet, pp. 38–44. Bibliography, pp. 40–44.

11. Homology of Joints and artificial Fractures. Abstract in the Journ. Geol. (Chicago), Vol. V., 1897, pp. 97, 98. Also in Science, Vol. V., 1897, p. 84.

12. Review of Rocks, Rock-weathering, and Soils, by George P. Merrill. Science, Vol. V., 1897, pp. 995–997.

By T. A. Jaggar: —

1. A Simple Instrument for inclining a Preparation in the Microscope. Am. Journ. of Sci., Vol. III. p. 129.
2. Ein Mikrosklerometer zur Härtebestimmung. Groth's Zeitschrift für Krystallographie, Munich. (In press.)
3. Edited Proceedings of Geological Conference of Harvard University, in Science, Vol. IV. No. 101.

By R. A. Daly (omitted from previous Report): —

The Quartz-porphyry and associated Rocks of Pequawket Mountain, N. H. Science, Vol. III., 1896, p. 752.

By J. E. Woodman: —

[Review of the Elevated Reef of Florida. By Alexander Agassiz. With Notes on the Geology of Southern Florida. By Leon S. Griswold.] The Jour. of Geol., Vol. V., 1897, pp. 312, 313.

By A. P. Chittenden: —

Mountain Structure of Pennsylvania. Bull. Amer. Geogr. Soc., Vol. XXIX. No. 2, 1897, pp. 175–180.

REPORT ON THE INSTRUCTION IN ZOÖLOGY.

By Professor E. L. Mark.

According to the proposal announced in my last Report, the courses in Zoölogy, till then designated as Zoölogy 6 and Zoölogy 7^1, were so expanded as to constitute the equivalent of three full courses, one course and a half being given in alternate years. The courses for the Academic year 1896–97 are designated as Courses 11 and 16^1; those for the coming year will be 10 and 15^1. Otherwise there was no considerable change in the work of the Department.

The number of students from the various schools and classes in each of the courses in Zoölogy for the past year is given, as usual, in the accompanying table.

Courses, 1896–97.	Grad.	Sen.	Jun.	Soph.	Fresh.	Spec.	*Sci.	Total.
Zoölogy 1 . . .		12	20	28	26	8	37	131
" 2 . . .	3	5	6	9	2	3	17	45
" 3 . . .	5	8	10	2			14	39
" 4 . . .	2	4	2				5	13
" 5 . . .	2	4	2				4	12
" 11 . . .	6	2					2	10
" 16 . . .	7	8	2	1			4	22
" 20*a* . . .	10						1	11
Totals . . .	35	43	42	40	28	11	84	283

Two large rooms on the second floor of the Museum, vacated by Dr. Wolff at the beginning of the Academic year, were assigned by the Curator to the Department of Zoölogy. One of these, the east room (No. 5), was converted into a lecture room and a laboratory for students engaged in research, being fitted up with tables and the necessary appliances. This furnished accommodations for the overflow from room No. 4, which had been temporarily provided for in the previous year by the liberality of the late Professor Whitney, who had surrendered for the year 1895–96 his lecture room on the first floor to the Department of Zoölogy for this purpose.

The other room, the west one (No. 6), was assigned as a private laboratory to Doctors Davenport, Parker, Woodworth, and Mayer. Zoölogy 1 was conducted by Dr. Davenport, substantially as last year. The Chief Assistant was Mr. H. R. Linville, the same as in the preceding year. Messrs. F. C. Lucas, W. J. Moenkhaus, S. R. Williams, and A. S. Hanna were Sub-Assistants.

In Zoölogy 2 the Department was also fortunate enough to have the services as Chief Assistant of the same person who had been Chief Assistant in the preceding year, Mr. J. I. Hamaker. The Sub-Assistant was Mr. R. W. Hall. The course was conducted by Dr. Parker without essential change from the plan of previous years.

A considerable increase in the number of students taking Zoölogy 3 caused the laboratory facilities to be taxed to their utmost. Any further increase in numbers would have to be met by increasing the number of days on which laboratory work might be done, and probably also by restricting the special topic work to those best qualified to profit by it. The course was conducted by Dr. Parker, who had as Assistants Messrs. J. H. Hathaway and R. W. Hall. The paper by Mr. Waite prepared in this course last year is now in press.

The lectures in Zoölogy 4 and 5 were given in the new room on the second floor; the laboratory work was done as usual in room No. 2 on the fourth floor. Dr. Woodworth conducted the laboratory work in both these courses, and gave a portion of the lectures in Course 4. The ground covered in the lectures and the material used in the laboratory work were substantially the same as in previous years. The courses were given as in previous years by Drs. Mark and Woodworth.

In Zoölogy 11, by Dr. Davenport, there were lectures throughout the year on phylogenetic problems. A separate topic was assigned to each of the ten students for special study. The results of some of these studies, though not yet in final shape, will be ready for publication before long. The laboratory work was mostly done in Room 5, Floor 2, the room assigned to students in Zoölogy 20*a*. This arrangement, so far as concerns the supervision of the work in this course, was an improvement on that of the previous year; but it is always undesirable to have the same table used for two kinds of work under the supervision of different instructors. But besides this, there is urgent need of rooms properly equipped for chemical, electrical, thermic, and photic work, which cannot be attempted under present conditions with any likelihood of success. Since my last Report the following "Contributions" embodying work done in connection with this course have been published: Nos. LXXII., LXXIV., and LXXIX. of the list embraced in this Report.

Zoölogy 16, by Dr. Parker, was given this year in accordance with the plan announced last year. After a short introduction to the study of the nervous system, the remaining lectures in the course were devoted to an extended consideration of the anatomy and physiology of the central nervous organs, and the terminal organs of efferent nerves. The experiment was tried of requiring each student to prepare a short paper on some topic connected with the subject matter of the lectures. This exercise, though stimulating to the student, can, of course, never form a satisfactory substitute for laboratory work. There were in regular attendance on the lectures four students who were not enrolled.

The number of students in Zoölogy 20*a* was not quite as large as in the previous year, but with the research students in Radcliffe College absorbed the most of the time of the instructor left from the work of Zoölogy 4 and 5. The "Contributions" written in this course, which have been completed and published since my last Report, are: Nos. LXX., LXXI., LXXVII., and LXXXI.; those which are "in press" are two by Porter, and one each by Neal, Lewis, Hamaker, and Linville.

At the last Commencement, the degree of Doctor of Science in Zoölogy was conferred upon Mr. Alfred Goldsborough Mayer, whose thesis was completed and published in the spring of 1896, and who was allowed, for reasons stated in my last Report, to come up for his examination in the autumn of 1896; also the degree of Doctor of Philosophy upon two candidates in Zoölogy, Mr. John Irvin Hamaker and Mr. Henry Richardson Linville. The titles of their theses appear in the Contributions now "in press."

Dr. H. S. Jennings has resigned the travelling Parker Fellowship, and returned to America. He expects to give his time in future to teaching and research. As the result of his studies in Jena during the winter, he has published in the Journal of Physiology a paper entitled, "Studies on Reactions to Stimuli in Unicellular Organisms. I. Reactions to Chemical, Osmotic, and Mechanical Stimuli in the Ciliate Infusoria."

The degree of A. M. was conferred on three students whose work was wholly or almost wholly in Zoölogy.

The continued generosity of the Curator of the Museum and the Corporation has permitted the publication in the Museum Bulletin of the greater number of the following Contributions from the Zoölogical Laboratory, all of which have appeared since my last Report: —

LXX. JENNINGS, H. S. — The Early Development of Asplanchna Herrickii de Guerne. A Contribution to Developmental Mechanics. Bull. Mus. Comp. Zoöl., Vol. XXX. No. 1, pp. 1–118. 10 Pls. October, 1896.

LXXI. NEAL, H. V. — A Summary of Studies on the Segmentation of the Nervous System in Squalus acanthias. A Preliminary Notice. Anat. Anzeiger, Bd. XII. No. 17, pp. 377–391. 6 Figs. October 20, 1896.

LXXII. DAVENPORT, C. B., AND CANNON, W. B. — On the Determination of the Direction and Rate of Movement of Organisms by Light. Jour. of Physiol., Vol. XXXI. No. 1, pp. 27–32. 1 Fig. February 5, 1897.

LXXIII. DAVENPORT, C. B., AND BULLARD, C. — Studies in Morphogenesis, VI. A Contribution to the Quantitative Study of Correlated Variation and the Comparative Variability of the Sexes. Proc. Amer. Acad., Vol. XXXII. No. 4, pp. 87–97. December, 1896.

LXXIV. MAYER, A. G. — On the Color and Color-Patterns of Moths and Butterflies. Bull. Mus. Comp. Zoöl., Vol. XXX. No. 4, pp. 167–256. 10 Pls. Feb. [Mar.], 1897. *Also* Proc. Bost. Soc. Nat. Hist., Vol. XXVII. No. 14, pp. 243–330. 10 Pls. March, 1897.

LXXV. PARKER, G. H. — The Mesenteries and Siphonoglyphs in Metridium marginatum Milne-Edwards. Bull. Mus. Comp. Zoöl., Vol. XXX. No. 5, pp. 257–272. 1 Pl. March, 1897.

LXXVI. PARKER, G. H. — Photomechanical Changes in the Retinal Pigment Cells of Palæmonetes, and their Relation to the Central Nervous System. Bull. Mus. Comp. Zoöl., Vol. XXX. No. 6, pp. 273–300. 1 Pl. April, 1897.

LXXVII. BUNKER, F. S. — On the Structure of the Sensory Organs of the Lateral Line of Ameiurus nebulosus Le Sueur. Anat. Anzeiger, Bd. XIII. No. 8 u. 9, pp. 256–260. March 3, 1897.

LXXVIII. WOODWORTH, W. McM. — On a Method of Graphic Reconstruction from Serial Sections. Zeitschr. f. wiss. Mikr., Bd. XIV. No. 1, pp. 15–18. July, 1897.

LXXIX. **Brewster, E. T.** — A Measure of Variability, and the Relation of Individual Variations to Specific Differences. Proc. Amer. Acad., Vol. XXXII. No. 15, pp. 269–279. May, 1897.

LXXX. **Davenport, C. B.** — The Rôle of Water in Growth. Proc. Bost. Soc. Nat. Hist., Vol. XXVIII. No. 3, pp. 73–84. June, 1897.

LXXXI. **Lewis, Margaret.** — Clymene producta, sp. n. Proc. Bost. Soc. Nat. Hist., Vol. XXVIII. No. 5, pp. 111–117. 2 Pls. August, 1897.

In Press.

Porter, J. F. — Two new Gregarinida. Jour. of Morphol., Vol. XIV. No. 1, pp. 1–20. 3 Pls. 1897.

Woodworth, W. McM. — Contributions to the Morphology of the Turbellaria. II. On some Turbellaria from Illinois. Bull. Mus. Comp. Zoöl., Vol. XXXI. No. 1, pp. 1–16. 1 Pl. October, 1897.

Porter, J. F. — Trichonympha, and other Parasites of Termes flavipes. Bull. Mus. Comp. Zoöl., Vol. XXXI. No. 3, pp. 45–68. 6 Pls. October, 1897.

Waite, F. C. — Variations in the Brachial and Lumbo-Sacral Plexi of Necturus maculosus Rafinesque. Bull. Mus. Comp. Zoöl., Vol. XXXI. No. 4, pp. 69–92. 2 Pls. November, 1897.

Lewis, Margaret. — Studies on the Central and Peripheral Nervous System of Two Polychæte Annelids. Proc. Amer. Acad. 8 Pls.

Davenport, C. B., and Perkins, Helen. — A Contribution to the Study of Geotaxis in the Higher Animals. Jour. of Physiol., Vol. XXII. Nos. 1 and 2, pp. 99–110. Sept. 1, 1897.

Neal, H. V. — The Segmentation of the Nervous System in Squalus acanthias. Bull. Mus. Comp. Zoöl., Vol. XXXI. No. 5. 9 Pls.

Hamaker, J. I. — The Nervous System of Nereis virens Sars. A Study in Comparative Neurology. Bull. Mus. Comp. Zoöl., Vol. XXXI. No. 6. 5 Pls.

Linville, H. R. — Maturation and Fertilization in Pulmonate Gasteropods.

During the Academic year 1896–97 the Division of Natural History under the Faculty of Arts and Sciences was split into two divisions, one of which, Biology, embraces the two Departments of Botany and Zoölogy. Dr. Farlow of the Botanical Department has been made Chairman, and Dr. Davenport has been chosen Secretary of this Division.

Hereafter Dr. R. T. Jackson is to give in the Zoölogical Department a course in Palæozoölogy under the title, "Fossil Invertebrates, — Lectures and Laboratory Work." This course is to run through the whole year, and is to be designated Zoölogy 9; it will be somewhat similar to the course Geology 13 of previous years, this course being discontinued.

It is with regret that I record the resignation of Dr. W. McM. Woodworth from the teaching force of the Department, to take effect at the beginning of the next Academic year. I wish to express the feeling of loss which we as a Department experience in the transference of Dr. Woodworth's energies from the College to the Museum, which is hereafter to receive all his attention, and further, to express the hope that at some time in the future a portion of his time may be again given to the work of instruction.

To provide for the work in teaching hitherto carried on by Dr. Woodworth, and at the same time to relieve Dr. Parker of a portion of his duties in instruction, Dr. William E. Castle has been appointed Instructor in Anatomy and Embryology. Besides assisting in the courses in Microscopical Anatomy and Embryology of Vertebrates (Zoölogy 4 and 5), he will have charge of Zoölogy 2.

Dr. Davenport, in addition to the work which he has done in connection with the courses under his charge and the papers produced in connection with them, has published Part I. of his work on "Experimental Morphology." This part deals with "Effect of Chemical and Physical Agents on Protoplasm," and is a book of nearly 300 pages, issued by the Macmillan Company, New York, 1897. Part II. of this work is also nearly completed. He has also published an article "On the Rôle of Water in Growth," as Contribution No. LXXX., and, in collaboration with Mr. C. Bullard, Contribution No. LXXIII. He has besides written for "Science" a review of the works of O. Hertwig and E. B. Wilson on "The Cell," and several reviews for "L'Année biologique," Tom. I., as well as an article on "College Admission Requirements" for the "Harvard Graduates' Magazine," December, 1896.

Dr. Parker has published two interesting illustrated papers: one on "The Mesenteries and Siphonoglyphs in Metridium," the other on "Photomechanical Changes in the Retinal Pigment Cells of Palæmonetes," etc., as Contributions LXXV. and LXXVI.

The paper on "Some Variations in the Genus Eucope," by the Curator and Dr. Woodworth, has been published since my last Report, and Dr. Woodworth has also published an article "On a

Method of Graphic Reconstruction from Serial Sections," Contribution No. LXXVIII. Another article by him on the Turbellaria of Illinois is now in the hands of the printer.

Early in the year the Department collections were enriched by a valuable and expensive series of Thiersch's transparent injection preparations, presented by Mr. B. S. Oppenheimer.

Near the middle of the College year the Zoölogical Club changed the time of its meetings from the evening to half-past four in the afternoon. From that time forward the meetings were held every week, instead of every two weeks as in previous years. Soon afterwards the advanced students in Zoölogy in Radcliffe College were invited to attend and participate in the discussions of the Club. The invitation was generally accepted. The meetings were well attended and the discussions profitable.

The number of students enrolled in the Zoölogical Courses in Radcliffe College was as follows: —

Zoölogy	1	2	3	4	5	15	20*a*
No. of Students . . .	14	9	4	2	2	5	6

REPORT ON THE MAMMALS AND BIRDS.

By William Brewster.

The past year has been singularly uneventful as far as the present department is concerned. Practically no changes have been made in the arrangements of the collections, and the only acquirements are the following

By gift. From William Brewster, a Mole (*Parascalops breweri*) from Lake Umbagog, Maine; two skins of Xantus's Jay (*Aphelocoma c. hypoleuca*), taken at La Paz, Lower California, by M. A. Frazer, and four skins of the Florida Crow (*Corvus a. floridanus*), taken at Fort Myers, Florida, by W. E. D. Scott. From Mrs. J. J. Glesner, a double nest of a Vireo (apparently *V. olivaceus*). Twenty-three skins of Mammals from Borneo and Great Natuna Island, and nineteen skins of birds from Borneo and Celebes, collected by E. and C. Hose, were presented by Dr. W. H. Furness through Professor Jayne.

During the past winter Mr. G. S. Miller, Jr., has made extensive use of the Museum material in connection with the study and determination of a collection of Mammals and Birds obtained by him in the region north of Lake Superior in the summer of 1896. Lieut. W. Robinson has also consulted the collections on several occasions, and Mr. Freeze of the Washington Grammar School has been supplied with bird skins which he has used for purposes of instruction in the school. These specimens have been duly returned. It is to be regretted that assistance of this kind cannot be more freely and generally given, but for the reason explained by Mr. Agassiz in his Report for 1890 and 1891 (pp. 8 and 9), it is impracticable to do this to any considerable extent.

The general condition of the collections is most satisfactory. Insect pests appear to have been wholly exterminated. At least, during the past year no signs of their presence have been detected.

The Assistant in this department has published the following papers and notes in "The Auk."

Occurrence of the Wood Ibis (*Tantalus loculator*) in Bristol County, Massachusetts.

On the Nomenclature of certain Forms of the Downy Woodpecker (*Dryobates pubescens*).

The Lesser Snow Goose in New England.

The Bahaman Swallow in Florida.

REPORT ON THE REPTILES AND FISHES.

By Samuel Garman.

Much the largest addition to these collections was obtained in exchange from Dr. Fernand Lataste. It was composed of desirable representatives of the faunas of Chili and of Algeria, Reptiles, Batrachians, and Fishes. Mr. W. H. Phelps donated the fine collection of Reptiles and Batrachians secured by him in Venezuela to these departments, after making a thorough study of it in connection with the Museum's material. The "Great Barrier Reef Expedition" of 1896 supplied an excellent series of Australian desiderata, collected by Messrs. Woodworth, Mayer, and Olive. Outram Bangs, Esq., added quite a number of species to his contributions from Florida. Accessions from various localities have also been received from Professor G. H. Parker, Dr. L. C. Jones, and Messrs. I. T. Jones, Roswell H. Johnson, Herbert W. Taylor, C. M. F. Flagg, and Lawrence Brooks. All receipts were in good condition.

Few shipments have been made. Besides what was furnished to the students in Zoölogy, a small lot of fishes went to the Laboratory of Indiana University. The material collected by Professor C. C. Nutting on his Expedition to the Bahamas, Cuba, and Florida Keys, for the University of Iowa, was made the basis of a report, and was returned to the University. The report as published is entitled "Report on the Fishes collected by the Bahama Expedition of the State University of Iowa, under Professor C. C. Nutting, in 1893," and appeared in the Bulletin of the Laboratory of Natural Sciences of the Iowa University, in 1896, and separately as a reprint.

Aside from the routine demands of the Exhibition series, and of the storage collections, the greater portion of the labor has been devoted to a continuation of the studies in deep-sea ichthyology, identification, dissection, drawing, all being more or less directly connected with that work, now approaching completion.

Of the general condition in the rooms occupied by the Fishes and Reptiles it may be said that the amount of loss, on account of decay, insect ravages, discoloration, evaporation, or breakage, is the smallest yet reported.

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

By Samuel Henshaw.

For acceptable additions to the collections, the Department is indebted to Miss Isabel Johnson, Messrs. A. L. Babcock, Outram Bangs, C. F. Batchelder, Frederick Blanchard, Charles Bullard, H. K. Burrison, P. P. Calvert, J. H. Emerton, W. G. Farlow, Walter Faxon, W. F. Fiske, J. W. Folsom, H. G. Gallagher, G. L. Goodale, Roland Hayward, Ralph Hoffmann, G. H. Horn, J. G. Jack, R. T. Jackson, A. G. Mayer, G. S. Miller, Jr., A. P. Morse, A. S. Packard, Wirt Robinson, S. H. Scudder, F. A. Sherriff, Roland Thaxter, C. M. Weed, W. L. Wilder, J. B. Woodworth, W. McM. Woodworth, and C. E. Worthington.

The Assistant has added several hundred specimens collected in Massachusetts and Southern New Hampshire. Many students and specialists have worked upon the collections during the past year.

The condition of the collections is highly satisfactory; at the last thorough examination, just completed, not a single case of injury from Anthreni or other destructive insects was discovered.

A revisional rearrangement of the Euchromiidæ, Notodontidæ, Saturniidæ, and Thyatiridæ of the Lepidoptera Heterocera, and of the Scutelleridæ of the Hemiptera Heteroptera, has been completed. Several genera of the Lepidoptera Rhopalocera have also been rearranged, and some additional progress made with portions of the Carabidæ, Scarabæidæ, and Tenebrionidæ of the Coleoptera. The rearrangement of the large series of Cynipidous galls has been begun, but is not completed.

In the Leconte collection of Coleoptera the final rearrangement of the Dascyllidæ, Rhipiceridæ, Elateridæ, Throscidæ, Buprestidæ, Lampyridæ, Malachidæ, Cleridæ, Ptinidæ, Cupesidæ, Lymexylidæ, Lucanidæ, Scarabæidæ, Spondylidæ, and Cerambycidæ has been completed.

Nine large boxes of galls have been prepared for exhibition in the Botanical Section of the Museum. This series includes some of the more important and commoner North American and European galls made by insects and mites; brief labels describe these galls, and in a few cases the architects of the galls are shown.

REPORT ON THE CRUSTACEA AND MOLLUSCA.

BY WALTER FAXON.

GIFTS of Crustacea and Mollusca have been received during the past year from Messrs. A. Agassiz, H. Ayers, O. Bangs, J. H. Blake, H. Garman, W. A. Hickman, R. T. Jackson, A. M. Norman, A. Ortmann, and W. McM. Woodworth. Of these the most valuable is a lot of Crustacea, comprising twenty-two species from Greenland and Davis Straits, — the gift of the Rev. A. M. Norman.

In the winter of 1893–94, I undertook, with Miss Parker's assistance, the systematic arrangement of the large collection of Molluscan shells stored in two rooms on the fifth floor of the Museum. A brief statement of the then condition of the collection, together with the system to be observed in its revision, was made in my Report for 1893–94. This work was brought to a finish during the spring of the present year. The shells are now not only easily accessible, but also (as I hope) in a state of permanent safety. The collection as now arranged is contained in 1,730 wooden drawers or trays (26½ × 17 in., inside measurement). Of these (to specify some of the larger divisions) the Muricidæ occupy 39 trays, the Volutidæ 44, the Conidæ 39, the Strombidæ 39, the Cypræidæ 48, the Melaniidæ 54, the Trochidæ 50, the Helicidæ 314, the Tellinidæ 35, the Veneridæ 47, the Unionidæ 271. In this collection are included the types of the shells described by J. G. Anthony and by Temple Prime; in many groups, moreover, the identifications were made by Mr. Anthony through a direct collation with the original types, so that the specimens have come to have a value second only to types.

The alcoholic collection of Mollusks, stored in the basement of the building, fills 95 trays. Here is found most of the deep-sea material from the "Blake" and "Albatross" dredgings, — material elaborated by Messrs. W. H. Dall and A. E. Verrill.

These collections, together with the extensive suites of mounted specimens in the Exhibition Rooms, make up the Molluscan wealth of the Museum.

REPORT ON THE VERMES.

By W. McM. Woodworth.

During the past year the entire collection of Annelids has been catalogued and arranged systematically, and considerable progress has been made in cataloguing and arranging the other groups.

The chief additions to the collections are a fine series of New Zealand and Australian Land Planarians received from Mr. Arthur Dendy, a collection of British Turbellaria from Mr. A. Lyster Jameson, a collection of fresh-water Planarians from Professor Paul Hallez, and one of Nemerteans from Dr. T. H. Montgomery. Thanks are also due to Professor J. S. Kingsley for contributions to the collections.

The Museum Gordiidæ were sent to Dr. T. H. Montgomery, and have been returned by him with a report based upon the collection. The Arenicolidæ have been forwarded to Mr. F. W. Gamble, of Queen's College, Manchester.

The United States National Museum collection of Nemerteans has been lent to the Assistant. This supplemented by the Museum material forms a superb collection for the study of the representatives of this group from the Atlantic and Pacific coasts.

The Assistant has published the following papers during the past year: —

Notes on Turbellaria. Am. Naturalist, Vol. XXX., 1896.

On the Occurrence of Filaroides mustelarum in American Skunks. Am. Naturalist, Vol. XXXI., 1897.

The Cambridge Natural History (a review). Science, N. S., Vol. V. No. 129, 1897.

On a Method of Graphic Reconstruction from Serial Sections. Zeitschr. f. wiss. Mikroskopie, Bd. XIV., 1897.

Contributions to the Morphology of the Turbellaria. II. On some Turbellaria from Illinois. Bull. Mus. Comp. Zoöl., Vol. XXXI. No. 1. 1897.

A report on the Planarians collected by the Barrier Reef Expedition is nearly ready for the printer, and good progress has been made with the "Albatross" Nemerteans.

REPORT ON THE ECHINODERMS, POLYPS, ETC.

BY ALFRED G. MAYER.

THE time of the Assistant has been mainly devoted to a general inspection and revision of the collection.

Many of the *ink written* labels of the alcoholic specimens had faded to such an extent as to be almost illegible. This was especially true of the Pourtalès types of Deep-Sea Corals. Several hundred labels were copied and replaced. In only two cases was it found impossible to decipher the original label.

The Assistant has added to the collection about thirty species of Medusæ, preserved in 5% formalin.

These were for the most part obtained at the Newport Laboratory. In addition to the above, about twenty-five species of Hydromedusæ from the Dry Tortugas, most of which are new to science, have been placed in the collection.

It is found that excellent Museum specimens of Medusæ may be made by killing and preserving them in 5% formalin. In many cases the animal is preserved in a perfectly natural attitude, and the gelatinous substance of the bell, etc. remains transparent. The colors of the proboscis, etc., however, usually fade, and the specimens are not suitable for histological work.

The Assistant has published "A New Hypothesis of Seasonal-Dimorphism in Lepidoptera," in Psyche, a Journal of Entomology, May-June, 1897.

REPORT ON THE DEPARTMENT OF VERTEBRATE PALÆONTOLOGY.

By Charles R. Eastman.

The most important additions to the collection since the date of the last Report consist of a unique series of Devonian Fishes from Iowa, and a number of choice specimens from the Cleveland Shale of Ohio. Several boxes of material from a newly discovered fish-bed in Johnson County, Iowa, were very generously presented by the State Geologist, Professor Samuel Calvin, and arrangements have since been made by which the Museum is enabled to participate in the further exploitation of this interesting deposit. A second instalment of Ohio material, purchased of Dr. William Clark, secured to the Department a valuable lot of specimens; and the representation of fossil Vertebrates from this State has been still further increased by exchanges, as noted below. It is fortunate that the faunal series should have become thus enriched in a direction wherein there formerly existed a deficiency.

The time of the Assistant has been devoted principally to the care and study of the collections under his charge. The display of specimens in the Systematic Exhibition Rooms has been rearranged, and the selection of fossils for the Palæozoic Room brought to a completion. During the present summer a field trip of a month's duration is contemplated. The success that has attended the operations of professional collectors in working up small but productive fields systematically, instead of skimming over a large area superficially, is sufficient demonstration of the economy and advantage of this method as applied to institutions. Concentration of effort in localities where there is a natural concentration of material, well known examples of which occur in this country, insures much better results than desultory gatherings over a wide district.

Additions to the Collection during the Year.

1896. Specimens of *Macropetalichthys*, *Gonatodus*, and other remains from the Corniferous Limestone, near Columbus, Ohio. Exchange with Dr. Edward Orton, State Geologist. Received December 23.

1896. Calvin Collection. A large assortment of fossil fish remains, chiefly Dipnoan and Chimæroid, from the so-called State Quarry Bed (presumably Upper Devonian) of Johnson County, Iowa. Presented by Professor Samuel Calvin. Received December 24.

1896. Clark Collection. Second instalment of fossil Fishes from the Cleveland Shale of Northern Ohio, including a figured cranium of *Dinichthys intermedius* and good examples of *Cladodus fyleri*. Purchased of Dr. William Clark, Berea, Ohio. Received December 26.

1897. Several well preserved specimens of *Semionotus* and *Catopterus* from the Trias of the Connecticut Valley; also a small collection of Green River Fishes. Exchange with Boston Society of Natural History. Received January 1.

1897. A set of plaster models from the Oxford Museum, presented through E. R. Lankester, Linacre Professor of Zoölogy. Received January 13.

1897. Casts of Palæozoic Fishes and Amphibians, presented by Professor E. D. Cope. Received January 18.

1897. Cavern bones from New South Wales, collected on the Australian Expedition of 1896. Received January 26.

1897. Vertebræ and portions of jaw belonging to type-specimen of *Baptanodon natans* Marsh. Exchange with Professor A. S. Packard. Received February 1.

1897. Specimen of *Macropetalichthys sullivanti*, showing interior of cranium, etc., from the Corniferous Limestone of Ohio. Exchange with Professor C. H. Hitchcock. Received March 22.

Papers Published during the Year.

Daniel Denison Slade [Biographical Sketch of]. New Eng. Hist. and Gen. Register, Vol. LI. pp. 3–14, January.

On the Characters of Macropetalichthys. Amer. Naturalist, Vol. XXXI. pp. 493–499, June.

On Ctenacanthus Spines from the Keokuk Limestone of Iowa. Amer. Journ. Sci. [4], Vol. IV. pp. 10–13, July.

Tamiobatis vetustus, a new Form of Fossil Skate. Amer. Journ. Sci., [4], Vol. IV. pp. 85–90, August.

On the Occurrence of Fossil Fishes in the Devonian of Iowa. Ann. Rep. Iowa Geological Survey, Vol. VII. pp. 108–116.

On the Relations of certain Plates in the Dinichthyids, with Descriptions of new Species. Bull. Mus. Comp. Zoöl., Vol. XXXI. pp. 19–44.

REPORT ON FOSSIL INVERTEBRATES.

By Alpheus Hyatt.

The Ammonitinæ of the Cretaceous have been studied and rearranged through the groups of Pseudoceratites and their immediate allies, including also the Phylloceratidæ and part of Lytoceratidæ. During the summer a number of species of Palæozoic Cephalopods have been selected for exhibition.

The Department is indebted to Dr. R. T. Jackson for revising the collections of Pteropods, Lamellibranchs, Worms, and Bryozoa, rearranging parts, and placing the whole in better condition, and also selecting material suitable for exhibition.

Part of the time of two Assistants has been expended in labelling and piecing together specimens of the Schary and other collections, and also in mounting some fossils for exhibition in the Stratigraphic Collection.

Hon. C. D. Walcott and Hon. Frank Springer have looked over parts of the collections, and selected materials to be sent them for investigation, and the latter has donated a choice collection of Palæozoic Crinoids.

Professor C. E. Beecher has given the Department some rare Devonian Phyllopods, and a specimen of Triarthrus beckii showing the appendages on the ventral side, and also his two beautiful restorations of that species illustrating the final results of his successful researches upon the external anatomy.

A lot of fine Trilobites from the Middle Cambrian of Mt. Stephen, British Columbia, has been presented by Messrs. F. N. Balch and G. L. Paine.

The superb work of Wachsmuth and Springer on "North American Crinoidea Camerata," in three large volumes, with eighty-three plates, noticed elsewhere in the list of the Memoirs of this Museum, has been partly based upon the materials accumulated in this department, and shows the exceptionally rich character of the collection of Crinoids.

REPORT ON THE LIBRARY.

BY MISS F. M. SLACK.

DURING the year ending September 1, 1897, the Library has received 548 volumes, 2,335 parts, and 150 pamphlets.

	VOLUMES.	PARTS.	PAMPHLETS.
Gift	13	60	56
Exchange	135	765	53
Purchase	28	270	0
A. Agassiz	176	1,240	41
Binding Parts	196	0	0
	548	2,335	150

The number of volumes now in the Library (exclusive of pamphlets and the Whitney Library) is 23,292. There are 17,251 pamphlets bound in 2,908 volumes, making the total number of volumes 26,200.

To this should be added the Whitney Library, containing about 5,000 volumes and 1,500 pamphlets, making the total volumes 31,200, and about 1,800 pamphlets not yet arranged by subjects for binding.

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PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE ACADEMIC YEAR 1896-97.

Of the Bulletin: —

Vol. XXVIII. (Geological Series, Vol. III.)

No. 2. The ELEVATED REEF of FLORIDA. By A. AGASSIZ. With Notes on the GEOLOGY of SOUTHERN FLORIDA. By L. S. GRISWOLD. pp. 36. 26 Plates. October, 1896.

No. 3. Notes on the ARTESIAN WELL sunk at KEY WEST, FLORIDA, in 1895. Based on a Collection made for ALEXANDER AGASSIZ. By E. O. HOVEY. pp. 30. December, 1896.

[Vol. XXVIII. *will be continued.*]

Vol. XXX. (October, 1896–April, 1897.)

No. 1. The Early DEVELOPMENT of ASPLANCHNA HERRICKII de Guerne; a Contribution to Developmental Mechanics. By H. S. JENNINGS. pp. 118. 10 Plates. October, 1896.

No. 2. Studies from the Newport Marine Laboratory. XL. Some VARIATIONS in the Genus EUCOPE. By A. AGASSIZ and W. McM. WOODWORTH. pp. 32. 9 Plates. November, 1896.

No. 3. Reports on the Results of DREDGING in the "BLAKE." XXXVII. Supplementary Notes on the CRUSTACEA. By W. FAXON. pp. 16. 2 Plates. November, 1896.

No. 4. Contributions from the Zoölogical Laboratory. LXXIV. On the COLOR and COLOR-PATTERNS of MOTHS and BUTTERFLIES. By A. G. MAYER. pp. 90. 10 Plates. February, 1897.

No. 5. Contributions from the Zoölogical Laboratory. LXXV. The MESENTERIES and SIPHONOGLYPHS in METRIDIUM MARGINATUM Milne-Edwards. By G. H. Parker. pp. 16. 1 Plate. March, 1897.

No. 6. Contributions from the Zoölogical Laboratory. LXXVI. Photomechanical CHANGES in the RETINAL PIGMENT CELLS of PALÆMONETES, and their Relation to the Central Nervous System. By G. H. PARKER. pp. 27. 1 Plate. April, 1897.

[Vol. XXX. *is complete.*]

Of the Memoirs: —

Vol. XIX. (July, 1893–May, 1897.)

No. 2. Reports on the Results of DREDGING in the "BLAKE," 1877–1880. XXXV. Description des CRUSTACÉS de la Famille des GALATHÉIDÉS recueillis pendant l'Expédition. Par A. MILNE-EDWARDS et E. L. BOUVIER. pp. 142. 12 Plates. May, 1897.

[Vol. XIX. *is complete.*]

Vols. XX., XXI. The NORTH AMERICAN CRINOIDEA CAMERATA. By CHARLES WACHSMUTH and FRANK SPRINGER. 2 Vols. pp. 837, and Atlas of 83 Plates. May, 1897.

[B]

INVESTED FUNDS OF THE MUSEUM.

IN THE HANDS OF THE TREASURER OF HARVARD COLLEGE, SEPT. 1, 1895.

Sturgis-Hooper Fund	$100,000.00
Gray Fund	50,000.00
Agassiz Memorial Fund	297,983.10
Teachers and Pupils Fund	7,594.01
Permanent Fund	117,469.34
Humboldt Fund	7,740.66
Virginia Barret Gibbs Fund	5,000.00
	$585,787.11

The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Curator. The accounts are annually examined by a committee of the Overseers. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts, with vouchers to the payment of which the income is applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Virginia Barret Gibbs Scholarship Fund, of the value of $250, is assigned annually with the approval of the Faculty of the Museum, at the recommendation of the Professors of Zoölogy and of Comparative Anatomy in Harvard University, "in supporting or assisting to support one or more students who have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy."

The income of the Humboldt Fund (about $300) can be applied for the benefit of one or more students of Natural History, either at the Museum, the United States Fish Commission Station at Wood's Hole, or elsewhere.

Applications for the tables reserved for advanced students at the Wood's Hole Station should be made to the Director of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

Cambridge

ANNUAL REPORT

OF

THE CURATOR

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT HARVARD COLLEGE,

TO THE

PRESIDENT AND FELLOWS OF HARVARD COLLEGE

FOR

1897-98.

CAMBRIDGE, U. S. A.:
UNIVERSITY PRESS: JOHN WILSON AND SON.
1898.

Gift of
A. Agassiz
Rec. Dec. 27, 1898

FACULTY OF THE MUSEUM.

Faculty.

CHARLES W. ELIOT, *President.*

ALEXANDER AGASSIZ.	GEORGE L. GOODALE.
——— ———, *Secretary.*	HENRY P. WALCOTT.

Officers.

——— ———, . . .	*Director and Curator.*
——— ———, ...	*Sturgis-Hooper Professor of Geology.*
NATHANIEL S. SHALER . . .	*Professor of Geology.*
WILLIAM M. DAVIS	*Professor of Physical Geography.*
EDWARD L. MARK	*Hersey Professor of Anatomy.*

APPOINTED BY THE FACULTY OF THE MUSEUM.

W. McM. WOODWORTH . . .	*Assistant in Charge.*
WALTER FAXON	*Assistant in Charge of Crustacea and Mollusca.*
SAMUEL GARMAN	*Assistant in Herpetology and Ichthyology.*
WILLIAM BREWSTER . . .	*Assistant in Ornithology and Mammalogy.*
ALPHEUS HYATT	*Assistant in Palæontology.*
SAMUEL HENSHAW	*Assistant in Entomology.*
ALFRED G. MAYER	*Assistant in Charge of Radiates.*
C. R. EASTMAN	*Assistant in Vertebrate Palæontology.*
MISS F. M. SLACK	*Librarian.*
MAGNUS WESTERGREN . .	*Artist.*

APPOINTED BY THE PRESIDENT AND FELLOWS.

R. T. JACKSON	*Instructor in Palæontology.*
C. B. DAVENPORT	*Instructor in Zoölogy.*
G. H. PARKER	*Instructor in Zoölogy.*
W. E. CASTLE	*Instructor in Anatomy and Embryology.*
R. DEC. WARD	*Instructor in Climatology.*
T. A. JAGGAR, JR.	*Instructor in Geology.*
R. J. FORSYTHE	*Instructor in Metallurgy.*
J. B. WOODWORTH	*Instructor in Geology.*
R. A. DALY	*Instructor in Physiography.*
S. R. WILLIAMS	*Assistant in the Zoölogical Laboratories.*
C. W. PRENTISS	*Assistant in the Zoölogical Laboratories.*
P. FRANDSEN	*Assistant in the Zoölogical Laboratories.*
H. W. RAND	*Assistant in the Zoölogical Laboratories.*
G. C. CURTIS	*Assistant in the Geographical Laboratory.*
J. E. WOODMAN	*Assistant in Geology.*
J. M. BOUTWELL	*Assistant in Physical Geography.*

RECEIVED,
DEC 27 1898
PEABODY MUSEUM.

REPORT.

To the President and Fellows of Harvard College: —

During the past year the usual courses of instruction have been given at the Museum in the Natural History Laboratories. Those in Zoölogy were given by Professor Mark, Doctors Davenport, Parker, and Castle, assisted in the Laboratory work by Messrs. R. W. Hall and F. C. Waite. Professors Shaler and Davis, together with Messrs. Robert T. Jackson, R. DeCourcey Ward, T. A. Jaggar, Jr., and J. B. Woodworth, gave courses of instruction in Geology, Palæontology, Physical Geography, and Meteorology. The Assistants in these Departments were Messrs. C. H. White, J. E. Woodman, and J. M. Boutwell.

For the details of these courses of instruction, as well as for those of the summer courses in Geology, I would refer to the accompanying special reports of the Professors and Instructors.

Professor Hans Reusch, Director of the Geological Survey of Norway, acted during the past year as Sturgis Hooper Professor, giving Lectures and assisting advanced students.

As the reports concerning instruction both in Geology and Zoölogy will hereafter appear in the circulars of the Division of Geology and Zoölogy, under the auspices of the Faculty of Arts and Sciences, it seems unnecessary to duplicate the publication in the Museum Reports.

The Newport Marine Laboratory was not opened this year to students of the Zoölogical Department as heretofore. The advanced students have found the necessary facilities at the Laboratory of the United States Fish Commission at Wood's Hole, to which students properly qualified have been admitted by the Hon. George M. Bowers, U. S. Fish Commissioner. The income of the Virginia Barret Gibbs Scholarship has been assigned according to the terms of the gift, and the income of the Humboldt Fund has been applied to assisting students working at the Wood's Hole Laboratory.

Professor Faxon reports that the principal additions to his Department consist of a large and very complete collection of North American land and fresh-water shells (over 20,000 specimens), presented to the Museum by Dr. R. Ellsworth Call of Lawrence, Indiana, and of a very beautiful collection of marine shells from the Straits of Malacca, presented to the Museum through Professor Goodale.

Messrs. Henshaw, Garman, and Brewster report the collections under their care in excellent condition. The additions to their Departments are enumerated in their Reports. The Departments in charge of Dr. Woodworth and Dr. Mayer need no special notice, as during the greater part of the year these two Assistants were absent with me in Fiji. Dr. Woodworth has left for Samoa to collect additional material for his Bololo paper, and Dr. Mayer has spent the greater part of the summer collecting Acalephs in the Tortugas and along the east coast of the United States.

To Professor Hyatt, to Mr. William Brewster, as well as to Dr. R. T. Jackson, the Museum is indebted for the care of their respective Departments.

The Exhibition Rooms have remained much as they were at the time of the last Report. A stand-pipe and hose have been placed in the Museum building in order to guard each floor against fire. The tables used for heating in the different Laboratories have been specially protected against the spreading of fire.

Specimens have been sent to Dr. Dendy, to Mr. H. A. Pillsbury, and to the Smithsonian Institution for examination, and a lot of Galapagos Turtles to the Hon. Walter Rothschild. A number of specialists have consulted the Entomological Department, and Mr. G. N. Calkins has examined our collection of Hydroids from the Pacific Coast of the United States.

In addition to the gifts specified in the different Reports, I may mention a collection of Fossil Medusæ from the Cambrian of Alabama, presented by the United States Geological Survey. Fossils from Griffin Landing, Savannah River, presented by Mr. C. B. Moore of Philadelphia. The collections made during my expedition to Fiji consist of Land Shells, Reptiles, Insects, Corals, and pelagic animals. An interesting fossil Egg (Struthiolithus) was purchased for the Museum through Mr. Eastman, and forms the subject of one of the Bulletins issued during the past year.

The Museum has, as in former years, provided the room for a great part of the instruction in Geology and Zoölogy given to the students of Radcliffe College, as well as to the large classes in the Summer School of Geology.

It seems only reasonable that some provision should be made for the use of the rooms so occupied, as the Museum has no source of income to meet the ever increasing demands made upon it by the policy of the University in granting the facilities of the Museum to persons who in no way promote its material welfare.

The increase of the Library by purchase, gift, and exchange has been somewhat larger than in former years. The Library now numbers nearly 32,000 volumes. Among the valuable additions to it I may mention some volumes of pamphlets on Land Shells, collected by Mr. William G. Binney, and a number of volumes from the Library of the late Colonel Theodore Lyman.

The Reports on the "Albatross" Expedition of 1891 are progressing favorably. Mr. Westergren has completed the Plates to accompany the Report on Fishes, and Mr. Garman has the text well advanced. The Report on the Ophiuridæ, by Messrs. Lütken and Mortensen, is in the press.

The Report on the Acalephs, by Dr. Otto Maas, has been published as No. 1 of Vol. XXIII. of the Memoirs. Of the Bulletin, Vol. XXXI. has been published during the past year, and two numbers of Vol. XXIII., and seven numbers of Vol. XXXII. They contain six numbers from the Zoölogical Laboratory in charge of Dr. Mark, two papers by Mr. Eastman, and two by Dr. Woodworth.

The Isopods of the "Albatross" Expedition, by Dr. Hansen, a Preliminary Report on the Echini of the same Expedition, by myself, as well as papers on Dactylometra and on Australian Medusæ in conjunction with Dr. A. G. Mayer, and a Report on my Expedition to the Great Barrier Reef of Australia.

In connection with the "Blake" explorations, I have published an interesting paper by Prof. R. T. Hill, on the Geological History of the Isthmus of Panama, and Professor Bouvier and Dr. Fischer have completed a memoir on the Pleurotomaria dredged by the "Hassler" off Barbados.

The Corporation has continued an appropriation of four hundred dollars to assist in publishing some of the theses from the Zoölogical Laboratory.

I spent the past winter in Fiji, accompanied by Dr. Woodworth and Dr. Mayer, in studying the Coral Reefs. The Expedition was most successful, the weather admirable, and an immense amount of material relating to coral reefs was collected. A preliminary account of the expedition has been published in the American Journal of Science for February and for July of this year. I hope during the early part of the coming year to publish the full Report of the Expedition, the text of which is nearly completed, while the accompanying plates are in the hands of the lithographers. In order to supply information which we could not obtain in our limited time I have been able, through the kindness of Professor David of Sydney, to engage Mr. E. C. Andrews to visit Fiji, and explore more in detail the elevated limestones which play so important a part in the history of the coral reefs of that group. Mr. Andrews reached Fiji in July, and has been at work there during the past summer.

I am specially indebted for facilities and assistance to Sir William C. Van Horne, and Mr. T. G. Shaughnessy of the Canadian Pacific Railroad, to Sir George O'Brien, Governor of Fiji, to the Hon. J. Stewart, Colonial Secretary, to Hon. W. L. Allardyce, Assistant Native Commissioner, to Mr. Berry, to Captain Calder, and to a number of friends in Fiji, to whom a great part of the success of our trip is due.

A List of the Publications of the Museum will be found in Appendix A, and a list of the publications of the officers and instructors other than those contained in our Memoirs and Bulletins will be found accompanying the special Reports.

This will be the last Museum Report which I shall have the honor to make. My resignation both as Curator and Director of the Museum, to take effect at the close of the present academic year, has been accepted by the Faculty of the Museum, and by the Corporation. This resignation was accompanied by certain conditions, which will be found in Appendix C.

The Faculty of the Museum has appointed Professor George L. Goodale and Dr. Henry P. Walcott as a Committee to take charge of the Museum, and Dr. W. McM. Woodworth has been appointed Assistant in charge.

Although my administrative connection with the Museum ceases now, I look forward to its future with no little concern. When the more intimate relation between the Museum and the University (dating back to 1876) was established, it was hoped that the new arrangement might prove advantageous to both institutions. So far as the Museum is concerned, this hope has not been fulfilled. While the divisions of Zoölogy and Geology in the University have been greatly expanded by the facilities afforded them by the Museum, the latter has gained no corresponding benefit from the University, nor has it received from the friends and graduates of Harvard the aid and support which might have been expected as a result of this mutual arrangement.

The funds available for carrying on the Museum and for promoting research are meagre in the extreme, and there are literally no means existing for the publication of the original work presented from the various laboratories. The slender thread which connected the Museum with the teaching departments at the time of its incorporation with the University is practically severed, the administration of the Museum being no longer in any way concerned with instruction, as was originally included in the articles of agreement between the University and the Museum. Under existing conditions the University Museum cannot hope to hold its own with similar institutions which have grown up in late years. The Natural History Museums in New York and in Chicago, connected as they are with municipalities which deal with them in a most generous and intelligent manner, will leave far behind a University Museum depending upon resources which grow annually less with a painful regularity.

ALEXANDER AGASSIZ.

CAMBRIDGE, September 1, 1898.

REPORT ON COURSES IN GEOLOGY AND PALÆONTOLOGY.

By Professor N. S. Shaler.

During the year ending September 1, Mr. Shaler gave lectures on Geology and Palæontology in Courses 4, 14, and 15, on Economical Geology in Course 18, and directed the work of advanced students in Geology. In this work, he was assisted by Dr. Jackson, and by Mr. J. E. Woodman. As chairman of the Division of Geology, much time was given to executive work in addition to that already required as Dean of the Lawrence Scientific School. As a member of the Massachusetts Highway Commission, some time was spent in the service of the Commonwealth.

Of scientific work done during the year, a Report on the Geology of the Richmond Basin, in co-operation with Mr. J. B. Woodworth, was brought to a finish, and investigations were carried on upon the Geology of Cape Cod, and the Pleistocene deposits of Eastern Massachusetts, the whole being a part of studies undertaken for the United States Geological Survey. During the summer of 1898, some observations were made upon the Lake Basins of Montana, which will later be made the subject of a report.

The following reports are subjoined as representing the work of Instructors and Assistants in the Laboratories of Geology and Palæontology, under the charge of Mr. Shaler.

Dr. R. T. Jackson reports as follows upon the instruction in Palæontology: —

(Geol. 14.) A course in Palæontology by N. S. Shaler, assisted by R. T. Jackson. Two lectures a week, with theses and laboratory work. (Taken as a half course by those omitting laboratory work.) Attended by twenty students, fourteen of whom took it as a half course.

(Geol. 15.) A course in Historical Geology, designed to train advanced students in the use of fossils in determining geological horizons, by N. S. Shaler and R. T. Jackson. Attended by five students.

Dr. R. T. Jackson reports that the collections used in teaching Palæontology are in good condition. Two additional cases for holding teaching collections were built. A fine series of Cambrian fossils from St. John, New Brunswick, was purchased of Mr. G. F. Matthew.

Mr. J. B. Woodworth reports as follows upon the instruction in General Geology: —

The instruction given by me this year included Courses 5, 8, and 16, and the supervision of the studies of certain students in Courses 22 *a* and 22 *b*, and of instruction given in Radcliffe College.

Course 5, Elementary Field and Laboratory Geology, was given in the second half year. It was attended by ninety-three students. The field work was conducted under the immediate charge of Mr. Woodman, who also acted as Assistant in the Laboratory. Mr. C. H. White was also assigned to this course as an Assistant in the Laboratory and the field. I wish to make especial mention of the services of Mr. H. T. Burr, and Ernest Haycock, both of whom gave voluntary assistance in the laboratory teaching, and in the field. These students placed themselves under the direction of the instructor in the course, with the view of obtaining experience in teaching. The experiment, as tried this year, was satisfactory to both parties. It is obviously an advantage to advanced students and to the Department for one of its officers to have a knowledge of the capacity to teach on the part of prospective applicants for positions in other institutions.

Course 8, General Critical Geology, was taken by sixteen men. In addition to the usual field and library work, some additional pains was taken to instruct students in the use of geological maps and reports, a work which was supervised by Mr. Woodman in the Library of the Museum. As in previous years, the attempt was made to make the field excursions illustrative of phenomena discussed theoretically in the Lecture Room, and at the same time to give the student training in the observation and interpretation of rocks and rock structures. The following localities were visited. In the autumn: (1) the Medford diabase dike; (2) the Mystic River quarries; (3) the westward extension of the Somerville quarries; (4) the Auburndale esker, and the Woodland sandplain, a study of glacial deposits. In the spring: (1) a basal section of the Carboniferous in the Norfolk County basin at Pondville, showing a typical section of sediments; (2) the overthrust in the Carboniferous area at Plainville, Mass.; (3) the North Attleborough collapsed anticline, including a study of Carboniferous felsite flows, and the Hoppin Hill Cambrian area; (4) the Attleborough syncline.

Course 16, Glacial Geology, was attended by twelve men. That part of the field work which was of a research character was directed towards a study of the extension of the boulder moraine at Arlington, of the moraine at Bridgewater, and of the morainal accumulations of India Point and Robin Hill at Providence, R. I.

The work in Course 22 *a*, in my charge, consisted of a study of the complex of sediments, lava flows, and breccias of the so called Wamsutta group lying in the towns of Attleborough, and North Attleborough, Mass. Messrs. H. T. Burr and R. E. Burke carried on investigations in this field in the autumn. This region, though one of extreme difficulty on account of the complicated structure of its rocks, is one of great geologic and petrographic interest, because the rocks of the group named now turn out to be accumulations of débris about a volcanic vent of Carboniferous age. Mr. Ernest Haycock worked to the south of this field in the autumn; and in the winter and spring, he took up bibliographic research on the Geology of Nova Scotia, supplementing his reading with an excursion to the islands off the south coast of that Province in the spring recess.

Course 22 *b*, Geologic Correlation, was taken by one student, working on the Hamilton formation of North America.

Among the additions to the collections of the Geological Laboratory there should be mentioned two models: one on the scale of 3:50,000 of the Dents du Midi, Tour Sallières, and Mont Ruan, Canton Valais, Switzerland; the other, a model of Nantucket, made by Mr. G. C. Curtis, on the basis of the U. S. Geological Survey Atlas sheet, and colored by him after maps by Professor Shaler and J. B. Woodworth. A collection of rocks, made by Dr. Pfeiffer, and illustrating the geology of the district represented in the first named model, was also obtained by purchase. Several specimens were given to the collection by Dr. R. T. Jackson, Mr. Charles H. White, Mr. J. M. Boutwell, and Professor Wolff.

Courses 5 and 8 were repeated to students in Radcliffe College, and a course of lectures, two a week, was given on Elementary

Geology, intended as a course parallel to Geology 4. Course 5 was given in the Laboratory in the first half of the year, when the room was not otherwise occupied; Courses *5a*, the Lecture Course, and 8, were given in the Lecture Room. In addition to these courses, one on Glacial Geology was conducted by Mr. Woodman. Thirty Radcliffe students were enrolled in these courses.

Scientific work was carried on as in the previous year, in co-operation with Professor Shaler, in the investigation of the Richmond area of Newark rocks in Virginia. The month of September, 1897, and a part of the mid-year examination period, were devoted to work in the field. A report on the structure and physical history of this basin was completed during the winter and spring, and submitted to the director of the U. S. Geological Survey in June, 1898. During the year there was published: —

Charles Thomas Jacksön, by J. B. Woodworth, American Geologist, Vol. XX., August, 1897, pp. 69–110, and a notice of La Face de la Terre, by Edward Suess, Vol. I., Paris, 1897, Science, Vol. VII., 1898, pp. 803–806.

The summer of 1898 was spent in Europe, including an examination of parts of the British Islands, Möens Klint, and the glaciers of the Rhone Valley and Chamonix.

Mr. J. E. Woodman carried on geological work in Nova Scotia in the summer of 1897, the results of which he has presented to the Boston Society of Natural History. In 1898, he led the elementary Summer School of Geology in Cambridge, and conducted field investigations in Cape Breton.

Mr. Jaggar reports as follows on the work done in the Laboratory of Experimental Geology.

During the past winter work has continued in the Laboratory of Experimental Geology under the direction of T. A. Jaggar. Mr. V. F. Marsters completed a research on the synthesis of basalt, reproducing in the Fourquignon furnace a series of crystalline basaltic rocks containing augite, hypersthene, picotite, labradorite, oligoclase, and olivine, with glass in varying amounts. Mr. G. H. Noyes completed two models illustrative of the effect of initial fracture in guiding the deformation of strata, and performed a series of experiments to illustrate the process of formation of glacial sand deltas.

An apparatus for imitating geyser eruption was added to the laboratory.

The following papers were published: —

A Microsclerometer for determining the Hardness of Minerals, Am. Jour. Sci., Vol. IV., 1897. Same in German, Groth's Zeitschrift für Krystallographie, Bd. XXIX., Heft 3.

Some Conditions affecting Geyser Eruption. Am. Jour. Sci., Vol. V., May, 1898.

An Occurrence of Acid Pegmatite in Diabase. Amer. Geologist, Vol. XXI., April, 1898.

In press: —

Death Gulch, a Natural Bear-Trap. Appleton's Pop. Sci. Monthly.

In the summers of 1897 and 1898, Dr. Jaggar has been engaged in work on the U. S. Geological Survey of the Yellowstone Park Timber Reservation under Mr. Arnold Hague, and the mining district of the Black Hills under Mr. S. F. Emmons. In the spring of 1898, a special investigation on "The Hardness of Nephrite and Jadeite" was completed, to be a chapter in a monograph on "Jade," prepared by Mr. Heber Bishop of New York. Dr. Jaggar has in preparation a Handbook of Experimental Geology.

REPORT ON COURSES IN PHYSICAL GEOGRAPHY.

By Professor W. M. Davis.

During the past year, no significant changes have been made in the courses on Physical Geography. With the exception of the advanced course (Geology 20), all were repeated for Radcliffe students. The course on the Physiography of Europe, first given two years ago, and now offered alternately with a course on the Physiography of the United States, has again been greatly aided by the use of the large scale topographical maps of the various European countries, which were brought from the College Library and temporarily placed in the Geographical Laboratory, as needed.

Special subjects since studied in the advanced course are as follows: the physical features of Norway, by Mr. R. L. Barrett; the coastal plain of Maine, by Mr. J. M. Boutwell; the drumlins and beaches of Nantasket, by Mr. R. B. Dixon; the Piedmont topography of Bavaria, by Mr. D. Gibbs; a classification of lakes, by Mr. W. L. W. Field; the topography of the neighborhood of Turner's Falls, Mass., by Mr. M. S. W. Jefferson, and the tidal phenomena of the Atlantic coast of the United States, by the same; and the Allegheny Plateau, by Mr. V. F. Marsters. In connection with this course, an excursion was made in the autumn to Syracuse, N. Y., for the purpose of examining the channels cut transversely across the northern spurs of the Allegheny plateau by temporary glacial streams, as first described by Mr. G. K. Gilbert.

Mr. Ward spent eight months, from June, 1897, to January, 1898, in making a tour around South America in order to gain some personal experience of weather and climate over a broad range of latitude. The points visited included Rio Janeiro, the National Observatory at Cordova, the Falkland Islands, the Strait of Magellan, Valparaiso, and the Harvard Observatory at Arequipa.

During his stay of three months in Peru, Mr. Ward inspected the meteorological stations of the Harvard College Observatory, including that on El Misti (19,200 ft.), the highest meteorological station in the world, and that at Cuzco. Extended barometer and psychrometer comparisons were made, and a full set of instructions was prepared, especially adapted to the needs of the observers at the various stations. A study of cloud movements was carried on at the Harvard College Observatory at Arequipa, the results of which are to be published in the " Meteorologische Zeitschrift "; special studies were made of the dust whirls, and of the *médanos* (crescentic dunes) of the desert. Some experiments in kite building, for the meteorological investigation of the free air, were carried on as well. The physiological effects of the high altitudes of El Misti, and of the Galera Tunnel (15,655 ft.) on the Oroya Railway, were studied; some sphygmograph curves obtained on El Misti have been reproduced in the " Journal of the Boston Society of Medical Sciences " (June, 1898), being the first curves from so great an altitude that have been reproduced. Mr. Ward made regular meteorological observations several times a day throughout his trip, the records obtained at sea being reported to the U. S. Hydrographic Office. Hourly observations of the surface temperatures of Lake Titicaca were made during two trips across that lake.

On returning to Cambridge, the course in Climatology previously given in the first half year was given in the second half year, so that Mr. Ward's absence caused no decrease in the amount of instruction offered in meteorology and climatology. The additions to the laboratory materials for use in meteorology and climatology made during the last half year have been a large-scale colored chart of mean annual isanomalous temperatures, a considerable number of diagrams enlarged for class use from text-book figures, and some three dozen lantern slides of meteorological phenomena.

Mr. Curtis has continued his work on the Harvard Geographical models, being chiefly engaged in making copies from the originals, for sale to various colleges and schools. The work thus became nearly self-supporting. The utility of the models being shown, Messrs. Ginn and Company have now undertaken the publication of the models, the work of casting and coloring being in the hands of Messrs. Paul Vogt and Sons of Boston. It is hoped that the three models already prepared may be only the beginning of an extended series.

Two courses have been given in the Summer School of 1898, a general course on Elementary Physiography, and the Physiography of the United States. Mr. M. S. W. Jefferson, and Dr. R. A. Daly acted as Assistants in the first course, and Mr. M. H. Wright in the second. Although the number of persons in attendance was smaller than a year ago, it is thought that the work thus done is effective in promoting the better teaching of geography, inasmuch as instructors in colleges, normal schools, and academies, as well as teachers in high and grammar schools, were enrolled in the classes. A number of field excursions were made in each course, including visits to Provincetown and Shelburne Falls, Mass., Portland, Me., Monadnock, N. H., and Meriden, Conn.

Professor Davis gave a course of eight lectures on Saturday mornings in the winter to school teachers of Boston and the neighboring cities, as one of the "Lowell Free Courses" in the Teacher's School of Science of the Boston Society of Natural History. The subjects here treated were such as would afford the most direct assistance in the work of teachers in grammar schools. In the spring, he delivered six lectures in the Brookline High School, On the Relation of Man to the Earth. Before the opening of the Summer School, he attended a conference called by a Committee of the National Educational Association, and held in Springfield, Mass., July 1 and 2, for the purpose of defining a course in Physical Geography appropriate for the high schools of the country. It was interesting to notice that all the members of the conference, ten in number, appointed by various educational organizations in different parts of the country, had at one time or another attended Harvard courses in geology or geography, with the exception of one, who was afterwards enrolled as a member of the first course in geography during the current summer. The report of the conference will be published in an early number of the Journal of School Geography.

Much time has been given during the year to the preparation of an elementary textbook of Physical Geography, adapted to use in high schools; Mr. W. H. Snyder, Master in Science at Worcester Academy, being associated with the writer in the latter part of the work. The book is now in press, and will be published in the autumn. In the absence of Professor Schilling, Professor Davis has taken his place as Chairman of the Committee of Special Students in Harvard College during the academic year. During the coming year he will be absent in Europe, his work being in part undertaken by Dr. Daly.

EXCURSIONS AND CONFERENCES.

New Mica Mines near Pompton, N. J.; Professor Wolff.

On the Arapahoe and Denver Deposits, Colorado; Professor Davis.

Some of the Results of a recent Excursion to the Western United States; Dr. Albrecht Penck.

Abstract of Gilbert's Essay on "Modification of the Great Lakes by Earth Movement"; Mr. J. M. Boutwell.

The Effects of Marine Erosion on the West Coast of Norway; Professor Reusch.

The Causes of recent Mountain-building Movements in Eastern New England; Professor Shaler.

Gold Mining in the Ural Mountains; Dr. Charles Palache.

The Middle Devonian Faunas of Western New York; Mr. A. W. Grabau.

The Crushing of Rocks by Glacial Action; Mr. J. B. Woodworth.

The Spring Excursion to New Jersey; Mr. J. E. Woodman.

Review of Geikie's Ancient Volcanoes of Great Britain; Dr. Jaggar.

Glacial River Channels of Western New York; Mr. M. S. W. Jefferson.

Remarks on a copy of the German Edition of Vespucci's Third Voyage, printed in Nuremberg by Wolfganng Huerber in 1505; Mr. J. B. Woodworth.

Some Recent Observations in Norway; Mr. R. L. Barrett.

New Lantern Views of Physiographic Features, taken during a summer trip across the United States and Canada; Professor Davis.

The Geology of the Dents du Midi in Switzerland; Dr. G. J. Pfeiffer.

Review of Geikie's "Founders of Geology"; Mr. J. E. Woodman.

Death Gulch, a Natural Bear-Trap; Dr. Jaggar.

Some Conditions affecting Geyser Eruption. Dr. Jaggar.

Geology of the Wamsutta Group near Attleborough Falls; Messrs. H. T. Burr and R. E. Burke.

The Classification of Lakes; Mr. W. L. W. Field.

De Margerie's translation of "Das Antlitz der Erde," by E. Suess (review); Professor Davis.

Localized Stages in Growth; Dr. R. T. Jackson.

De Geer's new theory for the Origin of Eskers; Professor Reusch.

An Excursion in the Fassathal, Tyrol; Dr. Eakle.

Review of Michel-Levy's "Notes on the Puys, Monte Doré, and the Eruptions of the Limage"; Mr. V. F. Marsters.

Tides in the Chesapeake and Deleware Bays; Mr. M. S. W. Jefferson.

Some Glacial Deposits near Bridgewater, Mass.; Mr. H. T. Burr-

The Coastal Plain of Maine; Mr. J. M. Boutwell.

A Glacial Drainage System passing through Lunenburg, Mass.; Mr. J. S. Pray.

Some recent Accessions to the Collection of Fossil Vertebrates; Dr. C. R. Eastman.

Deltas and Outlets of the Glacial Lake Bouvé; Mr. A. W. Grabau.

A Geological Model of Nantucket; Mr. G. C. Curtis.

Recent Investigations in the Archæan Rocks of Scandinavia; Professor Reusch.

Placer Gold Deposits; Professor Shaler.

Evidences of a Paleozoic Ice Age in Northern Norway; Professor Reusch.

A recent Geological Survey of the Eastern Border of the Yellowstone Plateau; Dr. Jaggar.

A recent Scientific Voyage to South America; Mr. R. De C. Ward.

Note on Nitrate Deposits of the Atacama Desert; Dr. Palache.

Physiography of Cuba; Mr. J. M. Boutwell.

Geology of the Richmond Basin; Mr. J. B. Woodworth.

Landslip Erosion in Norway; Professor Reusch.

On certain Relations between Streams and Divides; Professor Shaler.

The Elevated Shore-Lines of Monhegan Island; Mr. G. C. Curtis.

The Structure of Steel and of Metallic Alloys; Mr. Albert Sauveur.

The St. Louis Tornado of May 27, 1896; Mr. Ward.

The Waterspout off Martha's Vineyard, August 19, 1896; Mr. Ward.

The Snowstorm of January 31—February 1, 1898; Mr. Ward.

The Gay's River Conglomerate, Nova Scotia; Mr. J. E. Woodman.

General Account of the Geology of Nova Scotia; Mr. E. Haycock.

Note on peculiar Geological Work of certain Plants; Mr. C. H. White.

EXCURSIONS.

Northampton, Mass.; Professor B. K. Emerson, of Amherst College.

The Narragansett Basin, Mass.; Mr. J. B. Woodworth.

North Attleborough, Mass.; Mr. J. B. Woodworth.

Implement-bearing beds at Trenton, N. J.; Mr. J. E. Woodman.

Connecticut Valley; Dr. Palache.

Essex, Mass.; Mr. John H. Sears.

PUBLICATIONS BY OFFICERS AND STUDENTS OF THE DEPARTMENT OF GEOLOGY AND GEOGRAPHY SINCE THE LAST REPORT.

By N. S. Shaler: —

Outlines of the Earth's History. D. Appleton & Co., New York. 12mo. 1898.

By W. M. Davis: —

The Present Trend of Geography. Address at the University Convocation of the State of New York. Albany, 1897.

Home Geography. Journ. School Geogr., 1897, I. 2–7.

The Temperate Zones. Ibid., 1897, I. 139–143.

Topographic Maps of the United States. Ibid., 1897, I. 200–204.

Winds and Ocean Currents. Ibid., 1898, II. 16–20.

Waves and Tides. Ibid., 1898, II. 122–132.

The Equipment of a Geographical Laboratory. Ibid., 1898, II. 170–181.

Geography as a University Subject; read at the Toronto Meeting of the British Association. Scottish Geographical Magazine, 1897, pp. 24–29.

Winds and Ocean Currents. Scottish Geogr. Mag., 1897, pp. 515–523.

Report on the Triassic Formation of Connecticut. 18th Ann. Rep. U. S. Geol. Survey.

Current Notes in Physiography; in Science for 1896–97.

Physiography [of the vicinity of Boston], in Guide to Localities, etc., of the Vicinity of Boston, by Grabau and Woodman, Am. Assoc. Adv. Sci., 1898, pp. 1–7.

Notes on Publications on the Physiography of the United States for 1897 (with J. M. Boutwell), in Annales de Geogr. Bibliographie de l'Année, 1897.

By R. DeC. Ward: —

Meteorological Observations during an Atlantic Voyage. Science, Vol. VI., Aug. 27, 1897, pp. 324, 325.

Reviews of American Publications on Climatology in Annales de Géographie, 6 Année, 15 Sept., 1896. Bibliographie de l'Année, 1896. Paris, 8vo, 1897.

Meteorology in South America. Science, Vol. VI., Oct. 1, 1897, pp. 523–525.

A Winter Barograph Curve from the South Pacific Ocean. Monthly Weather Review, Vol. XXV., Nov., 1897, pp. 484, 485. Reprinted.

The Climatic Control of Occupation in Chile. Journal of School Geography, Vol. II., Dec., 1897, pp. 289–292.

A Visit to the Highest Meteorological Station in the World. Boston Medical and Surgical Journal, Vol. 137, Dec. 16, 1897, pp. 637–639.

Water Surface Temperatures of Lake Titicaca. Science, Vol. VII., Jan. 7, 1898, pp. 28, 29.

Harvard's Meteorological Work on the West Coast of South America. Ibid, Jan. 21, 1898, pp. 95–98.

Climatic Contrasts along the Oroya Railway, Ibid, Vol. VII., Jan. 28, 1898, 133–136.

A Day in the Falkland Islands. Journal of School Geography, Vol. III., Feb., 1898, pp. 49–56.

A note on the South American Coastal Cloud. Science, Vol. VII., Feb. 11, 1898, pp. 211, 212.

Cumulus Clouds over a Fire. Monthly Weather Review, March, 1898, pp. 104, 105.

A Visit to the Highest Meteorological Station in the World. Ibid, April, 1898, pp. 150–152.

Sphygmograph Curves from 15,700 ft. and from 19,200 ft. above Sea Level. Journal Boston Society of Medical Sciences, June, 1898, 2 pp., 3 Figs. Reprinted.

Associate Editor, Journal of School Geography, New York.

Contributed Current Notes on Meteorology to Science regularly throughout the year.

By T. A. Jaggar: —

1. A Microsclerometer, for determining the Hardness of Minerals. Am. Jour. Sci., Vol. IV., December, 1897.
2. Ein Mikrosklerometer zur Härtebestimmung. Zeitschrift für Krystallog. Munich, Bd. XXIX. Heft 3, p. 262.
3. An Occurrence of Acid Pegmatite in Diabase. American Geologist, Vol. XXI., April, 1898.
4. Some Conditions affecting Geyser Eruption. Amer. Jour. Sci., Vol. V., May, 1898.
5. Death Gulch, a Natural Bear-Trap. Appleton's Popular Science Monthly. (In press.)

By J. B. Woodworth: —

1. Charles Thomas Jackson. American Geologist, Aug., 1897, Vol. XX. pp. 69–110.

2. Notice of La Face de la Terre, by Edward Suess, Vol. I., Paris, 1897. Science, 1898, Vol. VII. pp. 803–806. Separately printed, pp. 8.

By J. E. Woodman: —

(With A. W. Grabau) Guide to Localities illustrating the Geology, Marine Zoölogy, and Botany of the Vicinity of Boston. A. A. A. S., Fiftieth Anniversary Meeting, Boston, Aug., 1898, pp. 100.

By R. A. Daly: —

Studies in the so-called Porphyritic Gneiss of New Hampshire. Journal of Geology (Chicago), 1897, Vol. V. pp. 694–722, 776–794.

By M. S. W. Jefferson: —

The Post-glacial Connecticut at Turner's Falls, Mass. Journal of Geology (Chicago), 1898, Vol. VI. pp. 463–472.

By A. W. Grabau: —

1. The Geology of Eighteen Mile Creek. Bulletin Buffalo Soc. Nat. Sciences, 1898, Vol. VI. pp. i–xxiv, 1–91.
2. (With J. E. Woodman.) Guide to Localities, etc., cited above.
3. Notes on Contours. Journal School Geography, 1898, Vol. II. pp. 230–232.
4. Palæontology of the Cambrian Terranes of the Boston Basin. [Abstract.] Science, Vol. VIII. p. 505. Also, American Geologist, 1898.

By G. C. Curtis: —

A Model of Sea-shore Characteristics. Journal of School Geography, 1898, Vol. II. pp. 215–227.

REPORT ON THE INSTRUCTION IN ZOÖLOGY.

By Professor E. L. Mark.

The resignation of Dr. W. McM. Woodworth a year ago and the appointment of Dr. W. E. Castle as Instructor in Anatomy and Embryology changed slightly the distribution of work among the instructors in the Department, but the scope and nature of the lectures and laboratory work were not materially altered except in the case of Zoölogy 4, where the animal chosen for minute study was different from those selected in previons years.

The attendance upon the several courses in Zoölogy is shown in the accompanying table, which at the same time gives similar information about the students of Radcliffe College attending courses in Zoölogy.

Courses, 1897–98.	Grad.	Med.	Sen.	Jun.	Soph.	Fresh.	Spec.	Sci.	Total.
Zoölogy 1			10 *1*	13 *2*	21 *3*	31 *10*	10 *7*	36	121 *23*
" 2	2		1 *1*	5 *1*	10 *2*	4 *9*	2 *5*	24	48 *18*
" 3	2		3 *1*	4 *3*	1		*1*	10	20 *5*
" 4	4		8	3				5	15
" 5	4		2	2				4	12
" 9	1								1
" 10	5							1	6
" 15	3	2	4	2				3	14
" 20*a*	10 *1*							1	11
Totals . .	31 *1*	2	23 *3*	29 *6*	32 *5*	35 *19*	12 *13*	84	248 *46*

The figures in Italic refer to students in Radcliffe College.

Zoölogy 1 was conducted by Dr. Davenport, as usual. His Chief Assistant was Mr. R. W. Hall, and the Sub-Assistants were Messrs. H. G. Barber, A. S. Hanna, R. H. Johnson, and H. McBurney.

With the change in Instructors, Zoölogy 2 was transferred from Dr. Parker to Dr. Castle. The forms selected for laboratory work were nearly the same as those used in previous years; they were

Spirostomum and Stentor, Grantia, Metridium, Asterias, Nereis, Cambarus, Periplaneta, Helix, and Rana. Each student was required, as usual, to give six hours per week to laboratory work. There were regularly two lectures per week (Mondays and Wednesdays), and occasionally an additional lecture on Friday.

Mr. F. C. Waite was Assistant in the course, and is commended by Dr. Castle for his zeal and industry. Mr. H. G. Barber also assisted in the laboratory work to relieve Dr. Castle during hours when his engagements in another course required his presence elsewhere.

The only change made by Dr. Parker in conducting the work of Zoölogy 3 was to limit the permission to substitute topic work for the regular work during the last seven weeks of the course to those students whose work in the course had given evidence of their being likely to profit by this opportunity. Six students were thus permitted to omit the dissection of the pigeon and substitute for it comparative work on selected topics. The results obtained by two of these students may be later submitted for publication. Two students not enrolled in the course attended the lectures. Two Papers based upon work done in connection with this course in the previous year have been published since my last report: they are Nos. LXXXV. and LXXXVII. of the list of "Contributions" accompanying the present report.

It has been possible during the past few years to increase the anatomical preparations useful in this course by the best of those voluntarily made for that purpose by students in the course. These, together with those which the Department "Diener" has been able to make when not otherwise engaged, form a valuable part of the material for the illustration of lectures, and it is the purpose to increase this collection as rapidly as practicable.

In Zoölogy 4 the lectures on bibliography, the microscope, microtomes, and other matters of technique, were given as usual by Dr. Mark. There were three lectures per week, and students spent from six to ten hours per week in laboratory work, six hours being the required minimum. The object selected for study this year was the leech Clepsine. The laboratory work was conducted by Dr. Castle, who also gave seven of the lectures in the course, his subject being the anatomy and histology of Clepsine.

Zoölogy 5 was conducted as in previous years, the laboratory work being, however, under the direction of Dr. Castle. An arrangement was made with the students whereby the Laboratory acquires a selected portion of the preparations made in the course; these preparations are to be added from year to year to the embryological and histological collections already acquired.

The new course on Fossil Invertebrates, by Dr. R. T. Jackson, Zoölogy 9, was taken by one student, a graduate. It is expected that this course will be elected in future by an increasing number of zoölogical students, who need to supplement their knowledge of recent forms by the broader view which embraces extinct species, and the lessons taught by their sequence in time. A valuable collection of fifty species of Cretaceous and Tertiary Protozoa was purchased for use in this course.

The subjects treated of by Dr. Davenport in his lectures on Experimental Morphology (Zoölogy 10) were this year ontogenetic. As usual each student worked on a special problem. The results have in two cases been embodied in papers now ready for publication. A short paper giving the results of studies in this course in 1896-97 has recently been published as No. XCII. of the Contributions, and another paper based on the work of a student in Radcliffe College has also been published in the Contributions as No. LXXXVI. The provisions for work in the Aquarium Room in the basement have been of great value in this course, and the room itself has been made more agreeable and safe for work in the coldest weather by the addition of storm windows.

Zoölogy 15 was given by Dr. Parker, as usual. The general subject was this year "Sense Organs." Two students enrolled in the Medical School, in addition to those under the Faculty of Arts and Sciences, were in attendance on this course. When provision can be made for supplementing the lectures with laboratory work, the course will be more valuable, especially to zoölogical and medical students.

The number of students carrying on investigations under me (Zoölogy 20 *a*) was the same as in the previous year. The papers produced in this course and published since my last report are numbered LXXXII., LXXXIV., LXXXVIII., LXXXIX., XC., and XCI. in the Contributions. Those now in course of publication are by Tower, Folsom, Bancroft, Waite, and Galloway (Dero).

At the last Commencement, the degree of Doctor of Philosophy was conferred upon two candidates in Zoölogy, Mr. Frank Watts Bancroft and Mr. Frederick Clayton Waite. The subjects of their theses are given in the Contributions now in press. Dr. Bancroft has received an appointment to a Parker Fellowship, and proposes to study abroad. The recently established degree of Master of Science was conferred in June upon a student in Zoölogy who was in attendance at the University in the Graduate School during 1896–97, and the degree of A. M. upon six students whose work was chiefly zoölogical.

The more important of the Contributions from the Zoölogical Laboratory during the past year have been published in the Museum Bulletin as heretofore by the co-operation of the Curator and the Corporation of Harvard College. The following is a list of the Contributions which have been published since my report of 1896–97. To it is appended a list of those papers which are now ready for the press:—

LXXXII. PORTER, J. F. — Two new Gregarinida. Journal of Morphology. Vol. XIV. No. 1, pp. 1–20. 3 Pls. June, 1897. [Feb., 1898.]

LXXXIII. WOODWORTH, W. McM. — Contributions to the Morphology of the Turbellaria. II. On some Turbellaria from Illinois. Bull. Mus. Comp. Zoöl., Vol. XXXI. No. 1, pp. 1–16. 1 Pl. October, 1897.

LXXXIV. PORTER, J. F. — Trichonympha, and other Parasites of Termes flavipes. Bull. Mus. Comp. Zoöl., Vol. XXXI. No. 3, pp. 47–68. 6 Pls. October, 1897.

LXXXV. WAITE, F. C. — Variations in the Brachial and Lumbo-Sacral Plexi of Necturus maculosus Rafinesque. Bull. Mus. Comp. Zoöl., Vol. XXXI. No. 4, pp. 71–92. 2 Pls. November, 1897.

LXXXVI. DAVENPORT, C. B., AND PERKINS, HELEN. — A Contribution to the Study of Geotaxis in the Higher Animals. Jour. of Physiol., Vol. XXII. Nos. 1 and 2, pp. 99–110. Sept. 1, 1897.

LXXXVII. PARKER, G. H., AND TOZIER, C. H. The Thoracic Derivatives of the Postcardinal Veins in Swine. Bull. Mus. Comp. Zoöl., Vol. XXXI. No. 6, pp. 133–144. 4 text figures. March, 1898.

LXXXVIII. GOTO, S. — The Metamorphosis of Asterias pallida, with Special Reference to the Fate of the Body Cavities. Jour. Coll. Science, Vol. X. Pt. 3, pp. 239–278. Pls. 19–24. June, 1898.

LXXXIX. NEAL, H. V. — The Segmentation of the Nervous System in Squalus acanthias. A Contribution to the Morphology of the Vertebrate Head. Bull. Mus. Comp. Zoöl., Vol. XXXI. No. 7, pp. 147–294. 9 Pls., 11 text figures. May, 1898.

XC. **Lewis, Margaret.** — Studies on the Central and Peripheral Nervous System of Two Polychæte Annelids. Proc. Amer. Acad. Arts and Sci., Vol. XXXII. No. 14, pp. 225–268. 8 Pls. April, 1898.

XCI. **Hamaker, J. I.** — The Nervous System of Nereis virens Sars. A Study in Comparative Neurology. Bull. Mus. Comp. Zoöl., Vol. XXXII., No. 6, pp. 89–124. 5 Pls. June, 1898.

XCII. **Field, William L. W.** — A Contribution to the Study of Individual Variation in the Wings of Lepidoptera. Proc. Amer. Acad. Arts and Sci., Vol. XXXIII., No. 21, pp. 389–396. 5 text figures. June, 1898.

XCIII. **Mark, E. L.** — Preliminary Report on Branchiocerianthus urceolus, n. g. et n. sp. Bull. Mus. Comp. Zoöl., Vol. XXXII. No. 8, pp. 145–154. 3 Pls. August, 1898.

In Press.

Linville, H. R. — Maturation and Fertilization in Pulmonate Gasteropods.

Tower, W. L. — The Nervous System of the Cestode Monezia expansa. 6 Pls.

Folsom, J. W. — The Anatomy and Physiology of the Mouth Parts of the Collembolan Orchesella cincta L. 4 Pls.

Bancroft, F. W. — Ovogenesis in Distaplia occidentalis Ritter (MS.), with Remarks on other Species. 6 pls.

Waite, F. C. — Structure and Development of the Antennal Glands in Homarus americanus Milne-Edwards. 6 Pls.

Galloway, T. W. — Observations on Non-sexual Reproduction in Dero vaga. 5 Pls.

Rand, H. W. — Regeneration and Regulation in Hydra viridis. Numerous figures.

Galloway, T. W. — Effect of Temperature on Growth of Tadpoles.

Dr. Davenport has spent considerable time in the completion of the second volume of his work on "Experimental Morphology," which is now in the hands of the publisher. He shared in the production of Contribution No. LXXXVI., and has contributed articles and reviews to "L'Année biologique," and "The American Naturalist." During the present summer he is Director of "The Biological Laboratory of the Brooklyn Institute of Arts and Sciences, located at Cold Spring Harbor, L. I., N. Y."

Dr. Parker has published, in collaboration with Mr. C. H. Tozier, Contribution No. LXXXVII., and has written book notices and reviews for "The American Naturalist." He has in preparation two papers, one "On Longitudinal Division in Metridium and the consequent Arrangement of Mesenteries," the other "The Photomechanical Changes in the Retinal Pigment of Gammarus." In co-operation with a student of Radcliffe College he is also preparing an article on "The Coronary Blood Vessels of Fishes."

Dr. Castle has in progress a paper dealing with the Anatomy and Classification of the Genus Clepsine, which has been the outgrowth of studies begun in connection with the class work in Zoölogy 4.

I have written a short article on "A Table of Ocular Micrometer Values," Jour. of Applied Microscopy, Vol. I. No. 1, p. 4, and a preliminary account of the external anatomy of a new and interesting deep-sea Actinian dredged by Mr. Agassiz in the Gulf of Panama. It is the last of the Contributions published, being No. XCIII.

The opportunities for the study of Marine Zoölogy which the instructors and students of the Department have so long enjoyed at the private laboratory of the Director at Newport, and which the demands of his own investigations have now compelled him to withdraw, are in a measure supplied by the facilities offered at the U. S. Fish Commission Laboratory at Wood's Hole; but the Department cannot fail to recognize, more clearly than ever, the great advantage which the Newport Laboratory has been to it in affording such exceptional opportunities for work and the collection of material for study in the laboratories at Cambridge.

REPORT ON THE MAMMALS AND BIRDS.

By William Brewster.

The past year has been uneventful in this department. The only acquisitions have been a Newfoundland Caribou (*Rangifer terræ-novæ* Bangs), male, bought of and mounted by J. H. Clark; a skin, a skull, and an alcoholic specimen of a buff-colored variety of the House Mouse (*Mus musculus*), and a skin of the Yellow-bellied Flycatcher (*Empidonax flaviventris*) taken at Lanesborough, Berkshire County, Massachusetts, June 1, 1898, presented by Walter Faxon; two eggs of a "large species of Black Tern" from the Fiji Islands, presented by Mr. Agassiz; a nest of the Kingbird (*Tyrannus tyrannus*), from Jaffrey, New Hampshire, presented by Miss Bertha Parker; and a nest and one egg of the Redstart, (*Setophaga ruticilla*), from Lincoln, Massachusetts, presented by W. McM. Woodworth.

The Assistant has published the following articles and notes.

In "The Auk": —

Geotrygon chrysea again at Key West.

Occurrence of the Spotted Screech Owl (*Megascops aspersus*) in Arizona.

Lewis's Woodpecker Storing Acorns.

Revival of the Sexual Passion in Birds in Autumn.

In "The Osprey": —

Notes on the American Three-toed Woodpecker (*Picoides americanus*).

In the "Boston Evening Transcript": —

A Letter criticising the Management of the Park Systems.

REPORT ON THE REPTILES AND FISHES.

By Samuel Garman.

One of the most valuable additions to the collections in these Departments was received from the Fiji Island Expedition of 1896, Fishes and Reptiles taken by Professor Agassiz and Messrs. Woodworth and Mayer. The specimens are in fine condition, and supply much wanted material for the Faunal Exhibition Rooms. Other contributions were received from Outram Bangs, Esq., Mr. Harry Clayton, Prof. C. H. Eigenmann, Dr. W. H. Furness, Mr. I. T. Jones, Mr. J. M. Mackaye, E. Montanus, Esq., Prof. A. P. Morse, Prof. G. H. Parker, Lieutenant Wirt Robinson of the U. S. Army, Rev. Robert K. Smith, and Dr. J. H. Wright. Several specimens desired for special dissections were received from the United States National Museum, through the kindness of Hon. C. D. Walcott. Certain duplicates were given out for students' use, and others were made subjects of special studies by Mr. Reginald H. Howe, and by Mr. F. Schuyler Mathews, the last illustrating a number of the species in a recently published work.

Some changes have been made in the alcoholic specimens of the Exhibition Rooms, and preparations made for others, rendered necessary by the bleached condition of specimens that have been exposed to the light for considerable periods. The tendency to bleach, to lose the markings and become uniform pale or white leads to the greater part of the deterioration; the evaporation from jars once properly closed amounts to little; the discolored label is easily replaced, but the faded specimen must be discarded for a new and fresh one. On account of the oily tissues of many species, discoloration continues in the alcohol for many years, though constantly growing less in amount.

REPORT ON THE ENTOMOLOGICAL DEPARTMENT.

By Samuel Henshaw.

Acknowledgments of gifts of specimens are due Miss Helen W. Leach, Miss Clara Osterberg, Messrs. A. Agassiz, A. L. Babcock, Outram Bangs, Frederick Blanchard, J. W. Blankinship, F. C. Bowditch, Charles Bullard, H. K. Burrison, P. P. Calvert, W. E. Castle, J. R. Chadwick, C. B. Cory, W. W. Dodge, W. G. Farlow, Walter Faxon, W. F. Fiske, J. W. Folsom, G. L. Goodale, Roland Hayward, G. H. Horn, J. G. Jack, R. T. Jackson, D. S. Jordan, A. H. Kirkland, E. L. Mark, A. G. Mayer, C. J. Maynard, A. P. Morse, J. G. Needham, F. W. Putnam, Wirt Robinson, S. H. Scudder, and W. McM. Woodworth.

Among the more valuable additions are the specimens brought from the Fijis by Mr. Agassiz and his assistants, a series of Odonata and Coleoptera from the Pacific States, and a collection of more than 2,400 exotic Hesperidæ presented by Mr. Scudder. Mr. Scudder has also given the first series of the parasitic Diptera and Hymenoptera, described in his Butterflies of New England.

The condition of the collection is excellent, and its use by specialists constant. A moderate estimate shows that a third of the Assistant's time is given to aid those who personally consult the collection, or who ask for comparisons and identifications.

As in former years Miss Parker's time has been devoted wholly to a constant and careful inspection of the collection, and to labelling and mounting.

A revisional rearrangement of the Nymphalidæ of the Lepidoptera Rhopalocera, of the Cetonidæ, and of portions of the Cerambycidæ and Tenebrionidæ, has been completed. Some work in identification and arrangement has also been done in the Ichneumonidæ, Meloidæ, and Coccidæ. A final rearrangement of the Georyssidæ, Parnidæ, Heteroceridæ, and of part of the Chrysomelidæ of the Leconte collection of Coleoptera has been completed.

The biological series of Myrmeleonidæ, Hemerobridæ, and Phryganidæ have been rearranged.

A large part of the alcoholic material has been assorted and arranged.

Considerable time has been given to searching out and properly labelling the types among the Odonata. The department is especially rich in these types, but they are indicated in many ways and in various places. As found these types are marked with a red label bearing the legend Type, and a citation of the place of original description is added.

REPORT ON THE MOLLUSCA AND CRUSTACEA.

By Walter Faxon.

Mollusca. — Two collections of extraordinary value have been given to the Museum during the past year. Professor R. E. Call of Chicago has transferred to Cambridge his collection of shells, amounting to some 40,000 specimens, all identified, numbered, and catalogued. This collection is composed in the main of the land and fresh-water shells of North America, and for these it is wellnigh complete. The specimens were collected chiefly by Professor Call himself, and were selected with a view to illustrating the geographical range and variation of the different species. The worth of the collection is the greater since it has served as the basis for the various conchological memoirs that have been published by Professor Call.

The other gift that deserves special mention is a collection of marine East Indian shells (estimated at no less than 3,000 specimens), brought together over fifty years ago by Mr. Balestier of Singapore, and presented to the Museum by the heirs of the late Warren Delano. The shells comprised in this collection are still unidentified, but are remarkable for their perfection and beauty.

The Rev. R. K. Smith of Kansas City has added to the special collection of New England shells noticed in my Report for 1895–96, and has also given to the Museum a small lot of shells obtained during a recent visit to England and Wales. Mr. Agassiz has presented some Achatinellæ from Oahu, Hawaiian Islands, and a miscellaneous collection of shells from the Fiji Islands. For other gifts the Museum is indebted to Messrs. G. M. Allen, J. H. Blake, and R. H. Johnson.

Crustacea. — A collection made at the Fiji Islands in 1897–98 has been received from Mr. Agassiz. Various small lots of North American Crayfishes have been presented by Prof. H. Garman of Lexington, Ky., Prof. E. W. McBride of McGill University, Montreal, and Messrs. R. C. Osburn and E. B. Williamson of Columbus, O. Mrs. Annie T. Slosson has sent Isopoda from Miami, Fla. Material has also been received through exchanges made with the United States National Museum, and M. Henry Coutière of Paris. At M. Coutière's solicitation, our whole collection of Alpheidæ, except a few type specimens too precious to be exposed to the risks of so long a journey, was sent to Paris to be used in monographing the family. They have all been promptly returned, identified by M. Coutière. Miss M. J. Rathbun of the U. S. National Museum staff, has revised the perplexing group of "Fiddler Crabs" (*Uca* or *Gelasimus*), and in this connection has determined all the specimens in this Museum. I have identified the Portunidæ (answering to near 480 catalogue numbers), and a good part of the Grapsoid crabs. An article on the Crayfishes in the United States National Museum and the Museum of Comparative Zoölogy, including a revision of the Crayfishes of the Southern Hemisphere (the Parastacinæ), prepared by me in 1896, has been published this year by the United States National Museum (Proc. U. S. Nat. Mus., Vol. XX. pp. 643–694, Pl. 62–70, Feb., 1898).

REPORT ON VERMES.

BY W. McM. WOODWORTH.

OWING to the Assistant's absence from Cambridge during a large part of the year, but little progress was made in the arrangement of the collections. A generous share of the Turbellarian material collected by the Biological Experiment Station of the University of Illinois, and recently reported upon by its Assistant, has been received from that institution. The Department is indebted to Mr. H. Lyster Jameson for two small collections of European Turbellaria supplementing the larger collection presented by him last year. Thanks are also due to Messrs. R. W. Hall and R. H. Johnson, and to Lieut. Wirt Robinson, for additions to the collections.

The Museum collection of Gordiacea loaned to Dr. T. H. Montgomery has been returned by him, and his report on the collection published as one of the Bulletins of the Museum.

The authorities of the Zoölogical Department of Columbia University have loaned to the Assistant the splendid collections of West Coast Nemerteans of the Columbia expedition to Puget Sound. With the collection have also been loaned the preparations, drawings, and notes of the late B. B. Griffin, who had begun the study of the collection. It will be the endeavor of the Assistant to complete the work so well begun by Mr. Griffin.

Good progress has been made with the work on the "Albatross" Nemerteans, which has been interrupted by long absences from Cambridge.

The Assistant has published Some Planarians from the Great Barrier Reef of Australia. Bull. Mus. Comp. Zoöl., Vol. XXXII. No. 4, pp. 63–67. 1 Plate, April, 1898.

REPORT ON THE DEPARTMENT OF VERTEBRATE PALÆONTOLOGY.

By Charles R. Eastman.

The greater part of July and August, 1897, was passed by the Assistant in Iowa and Illinois, making collections of fossil fishes. Very gratifying success attended the operations at the State Quarry Fish-bed, near North Liberty, Iowa, where, as stated in the last Report, arrangements had been made with Professor Calvin whereby the Museum was able to participate with the Iowa State Geological Survey in its further exploitation. A force of quarrymen was engaged to blast out several hundred cubic yards of the cherty ledge at the base of an abandoned working alongside the Iowa River, after which the blocks were broken up on the spot and the fossils extricated in the rough. In all, ten boxes, weighing about three quarters of a ton in the aggregate, were shipped to Cambridge as the Museum's share, and their contents were carefully prepared out from the matrix during the past winter and spring.

Scientifically the material obtained from the State Quarry Fish-bed is of very great interest, not only on account of its excellent state of preservation, which allows the preparation of beautiful histological sections, but also because of the unique assemblage of Dipnoan remains. There are also a number of important geological problems bearing upon the deposit, some of which are discussed in the current volume of the Annual Report of the Iowa State Geological Survey. Some preliminary notes on the character of the fish fauna are also presented in the same Report, but the results of its detailed investigation have not as yet been published.

Collections belonging to several private individuals were examined by the Assistant in various places, but as the owners were unwilling to part with them except on an integral basis, it was not deemed expedient to increase our stock of duplicates to so large an extent for the sake of a much smaller proportion of choice desiderata.

From the vicinity of Rock Island, Illinois, some very striking vertebrate fossils were obtained, among which was a remarkably perfect head of *Dinichthys pustulosus*, found several years ago by Mr. A. S. Tiffany, of Davenport, and obtained by the Museum in exchange with Prof. J. A. Udden, of Augustana College. Several more or less fragmentary crania from equivalent strata (Hamilton limestone) near Milwaukee were also examined by the Assistant, with the result that the complete osteology has at length been worked out for this species. This led to a comparison of the osteology in as many other species and congeners, hitherto uninvestigated, as were accessible, the leading features of which have been prepared for a forthcoming Bulletin.

Finally, among the accessions of fossil fishes, a visit to Rochester enabled the Assistant to procure from Ward's Natural Science Establishment a number of especially desirable specimens, selected with a view toward completing our representation of Palæozoic forms. From Ward's also was purchased a fine mounted skeleton of the European Cavern Bear, which has been placed on exhibition in the room devoted to late Tertiary faunæ.

One of the most notable acquisitions of the year is the large and beautifully preserved ovulite from Northern China, identifiable as *Struthiolithus chersonensis*. Found originally some four years ago by a Chinese peasant, from whom it was purchased by Rev. W. P. Sprague, an American missionary residing in Kalgan, it remained in the possession of the latter until the spring of 1897, when it was brought to this country by a returning fellow missionary, Rev. J. P. Roberts, and was by him offered for sale to a number of scientific institutions. Efforts to conclude a transaction in Boston and Cambridge proved unsuccessful in the first instance, and after a time Mr. Roberts departed, taking the egg with him. Finally, after considerable correspondence, as well as a personal visit to Hartford by the Assistant, its purchase was effected and the specimen brought back to Cambridge. It is described in Vol. XXXII. No. 7 of the Museum Bulletin. Not long afterwards a plaster cast of the type was received as the gift of Professor Alexander Brandt, of Charkow, who described the first and only other specimen yet discovered.

During the year considerable progress has been made in the investigation of certain groups of Palæozoic fishes in the collection, together with others borrowed from various sources, and the results have been prepared for publication. With our accumulating stores of fossil vertebrates, and especially fishes, most of which have passed through a careful sorting-out process before entering the Museum, this Department promises to become in time one of the foremost centres for prosecuting investigations in comparative palæichthyology.

Plans have been perfected for another collecting trip during the early autumn, to include visits at Milwaukee, Burlington, and various well known localities in Iowa, Illinois, and Ohio. A few exchanges of material have also been arranged for.

Additions to the Collection during the Year.

1897. Mounted skeleton of *Ursus spelæus* Blumb., from Bone Cavern of Germany. Purchased. Received September 10.

1897. Calvin Collection. Second large instalment of fossil fishes from the State Quarry Bed (Upper Devonian) of Johnson County, Iowa, collected during the field operations for this year. Received September 13.

1898. *Struthiolithus chersonensis* Brandt. Fossil egg from superficial deposits in the vicinity of Kalgan, China. Purchased January 5.

1898. Cranium and dorso-median plate belonging to *Dinichthys pustulosus* Eastm., from Hamilton Limestone, Rock Island, Illinois. Also a few tritors of *Ptyctodus calceolus* N. and W. Exchange with Professor J. A. Udden, of Rock Island. Received January 11.

1898. A small collection of Saurian and Mastodon remains obtained by Dr. George J. Englemann some years ago along the Missouri River. Transferred from Peabody Museum, February 1.

1898. A select assortment of fossil fishes, principally Palæozoic, purchased of Ward's Natural Science Establishment, Rochester. Received February 7.

1898. Cast of tooth of fœtal Mammoth found within the body of adult at Niederweningen, near Zurich, Switzerland. Presented by Dr. G. J. Pfeiffer. Received February 5.

1898. Cast of type specimen of *Struthiolithus chersonensis* Brandt. Presented by Professor A. Brandt, of Charkow, Russia. Received March 2.

1898. Upper dental plate selected as type of *Ptyctodus ferox* Eastm., from Hamilton Limestone, Milwaukee, Wisconsin. Presented by Mr. E. E. Teller, of Milwaukee. Received March 11.

Papers Published during the Year.

Agassiz's Work on Fossil Fishes (Amer. Naturalist, Vol. XXXII. pp. 177–185), March.

On Remains of Struthiolithus chersonensis from Northern China, with Remarks on the Distribution of Struthious Birds (Bull. Mus. Comp. Zool., Vol. XXXII. pp. 127–144), August.

Dentition of Devonian Ptyctodontidæ (Amer. Naturalist, Vol. XXXII. pp. 473–488, 545–560), July–August.

Some new Points in Dinichthyid Osteology (Paper read before Amer. Assoc. Adv. Sci., Boston Meeting), August. Published in Amer. Naturalist, Vol. XXXII. pp. 747–768, October.

Discovery of a second fossil Egg of Struthiolithus (Geol. Mag., Vol. V. pp. 434–439), October.

REPORT ON INVERTEBRATE PALÆONTOLOGY.

By Alpheus Hyatt.

The revision of the genera of fossil Cephalopods has been continued during the past official year and completed through the Triassic period, the fossils rearranged and placed in better shape as regards labelling, especially those of the Schary and other Palæozoic collections.

Representative species of all the genera have been selected, mounted, and are now in large part ready for exhibition in the Stratigraphic Collection.

The Department is indebted to Dr. R. T. Jackson for a large amount of work done in selecting materials for exhibition in the Stratigraphic Collection, and in superintending the work of mounting and labelling them.

He has also spent considerable time upon the Brachiopoda, rearranging parts and greatly improving the condition of the collection as a whole.

Part of the time of two Assistants has been available, and this has been spent in mounting and labelling fossils for exhibition, as described above.

Mr. Charles Schuchert reports progress on the Palæozoic Starfishes which he borrowed for study.

The following papers have been published: —

The Zoölogical Section (F) of the American Association for the Advancement of Science, by R. T. Jackson. Science, Vol. VIII. No. 195, pp. 395–403.

Fossil Cephalopods in the British Museum (Review), by R. T. Jackson. Amer. Naturalist, Vol. XXXII. No. 382.

Localized Stages in Growth, by R. T. Jackson. Proc. Am. Ass. Adv. Sci., 1898, Vol. XLVII. pp. 359, 360.

Ink and Paper for Museum Labels, by R. T. Jackson. Proc. Am. Ass. Adv. Sci., 1898, Vol. XLVII. pp. 378, 379.

REPORT ON THE LIBRARY.

BY MISS F. M. SLACK.

DURING the year ending September 1, 1898, the Library has received 641 volumes, 2,422 parts, and 118 pamphlets.

	VOLUMES.	PARTS.	PAMPHLETS.
Gift	26	46	17
Exchange	182	750	63
Purchase	15	285	1
A. Agassiz	89	1,341	37
Library of Theodore Lyman	100	0	0
Binding Parts	229	0	0
	641	2,422	118

The whole number of volumes in the Library is now: —

Museum Library	23,933
Whitney Library	5,000
	28,933
Volumes of bound pamphlets	3,026
	31,959

The whole number of pamphlets is: —

Bound	17,965
Unbound, Museum Library	300
" Whitney Library	5,000
	23,265

LIBRARY OF THEODORE LYMAN.

In addition to the one hundred volumes counted in the increase of the Library, Mr. Lyman's books included the following: —

291 volumes of duplicates, the greater part of which being better bound than ours, were placed on the shelves, and the volumes withdrawn placed among duplicates.
63 volumes of bound pamphlets, chiefly duplicate.
A set of Challenger Reports.
A set of Museum Publications,
A set of Louis Agassiz's works.

[A]

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

FOR THE ACADEMIC YEAR 1897–98.

Of the Bulletin: —

Vol. XXVIII. (Geological Series, Vol. III.)

No. 4. A Visit to the Great Barrier Reef of Australia in the Steamer "Croydon," during April and May, 1896. By A. Agassiz. pp. 56. 42 Plates. April, 1898.

No. 5. The Geological History of the Isthmus of Panama and Portions of Costa Rica. Based upon a Reconnoissance made for A. Agassiz. By R. T. Hill. pp. 188. 19 Plates. June, 1898.

[Vol. XXVIII. is complete.]

Vol. XXXI. (October, 1897—May, 1898) contains: —

No. 1. Contributions from the Zoölogical Laboratory. LXXXIII. Contributions to the Morphology of the Turbellaria. II. On some Turbellaria from Illinois. By W. McM. Woodworth. pp. 16. 1 Plate. October, 1897.

No. 2. On the Relations of certain Plates in the Dinichthyids, with Descriptions of New Species. By C. R. Eastman. pp. 28. 5 Plates. October, 1897.

No. 3. Contributions from the Zoölogical Laboratory. LXXXIV. Trichonympha, and other Parasites of Termes flavipes. By J. F. Porter. pp. 24. 6 Plates. October, 1897.

No. 4. Contributions from the Zoölogical Laboratory. LXXXV. Variations in the Brachial and Lumbro-Sacral Plexi of Necturus maculosus Rafinesque. By F. C. Waite. pp. 24. 2 Plates. November, 1897.

No. 5. Reports on the Dredging Operations in the "Albatross" in 1891. XXII. The Isopoda. By H. J. Hansen. pp. 38. 6 Plates and Chart. December, 1897.

No. 6. Contributions from the Zoölogical Laboratory. LXXXVII. The Thoracic Derivatives in the Postcardinal Veins in Swine. By G. H. Parker and C. H. Tozier. pp. 14. March, 1898.

No. 7. Contributions from the Zoölogical Laboratory. LXXXIX. The Segmentatation of the Nervous System in Squalus acanthias. A Contribution to the Morphology of the Vertebrate Head. By H. V. Neal. pp. 54. 9 Plates. May, 1898.

[Vol. XXXI. is complete.]

Vol. XXXII. contains: —

No. 1. Studies from the Newport Marine Laboratory. XLI. On DACTYLOMETRA. By A. AGASSIZ and A. G. MAYER. pp. 12. 18 Plates. April, 1898.

No. 2. On Some MEDUSÆ from AUSTRALIA. By A. AGASSIZ and A. G. MAYER. pp. 8. 3 Plates. April, 1898.

No. 3. The GORDIACEA of certain American Collections. With particular Reference to the North American Fauna. By T. H. MONTGOMERY, JR. pp. 40. 15 Plates. April, 1898.

No. 4. Some PLANARIANS from the GREAT BARRIER REEF of AUSTRALIA. By W. McM. WOODWORTH. pp. 6. 1 Plate. April, 1898.

No. 5. Reports on the DREDGING OPERATIONS off the WEST COAST of Central America to the GALAPAGOS, etc., by the U. S. Fish Commission Steamer "Albatross." XXIII. Preliminary Report on the ECHINI. By A. AGASSIZ. pp. 18. 13 Plates and Chart. June, 1898.

No. 6. The NERVOUS SYSTEM of NEREIS VIRENS SARS. A Study in Comparative Neurology. By J. J. HAMAKER. pp. 48. 5 Plates. July, 1898.

No. 7. On Remains of STRUTHIOLITHUS CHERSONENSIS from Northern China, with Remarks on the Distribution of STRUTHIOUS BIRDS. By C. R. EASTMAN. pp. 17. 1 Plate. July, 1898.

No. 8. Reports on an EXPLORATION off the WEST COASTS of MEXICO, CENTRAL and SOUTH AMERICA, and off the GALAPAGOS ISLANDS, in charge of ALEXANDER AGASSIZ, by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. TANNER, U. S. N., Commanding. XXIV. Preliminary Report on BRANCHIOCERIANTHUS URCEOLUS, a New Type of Actinian, by E. L. MARK. 8 pp. 3 Plates. August, 1898.

[Vol. XXXII. *to be continued.*]

Of the Memoirs: —

Vol. XXIII. contains: —

No. 1. Reports on an EXPLORATION off the WEST COASTS of MEXICO, CENTRAL and SOUTH AMERICA, and off the GALAPAGOS ISLANDS, in charge of ALEXANDER AGASSIZ, by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. TANNER, U. S. N., Commanding. XXI. DIE MEDUSEN. Von OTTO MAAS. pp. 92. 15 Plates. September, 1897.

[Vol. XXIII. *to be continued.*]

[B]

INVESTED FUNDS OF THE MUSEUM.

In the Hands of the Treasurer of Harvard College, Sept. 1, 1898.

Sturgis-Hooper Fund	$100,000.00
Gray Fund	50,000.00
Agassiz Memorial Fund	297,933.10
Teachers and Pupils Fund	7,594.01
Permanent Fund	117,469.34
Humboldt Fund	7,740.66
Virginia Barret Gibbs Fund	5,000.00
	$585,737.11

The payments on account of the Museum are made by the Bursar of Harvard College, on vouchers approved by the Curator. The accounts are annually examined by a committee of the Overseers. The only funds the income of which is restricted, the Gray and the Humboldt Funds, are annually charged in an analysis of the accounts, with vouchers to the payment of which the income is applicable.

The income of the Gray Fund can be applied to the purchase and maintenance of collections, but not for salaries.

The income of the Virginia Barret Gibbs Scholarship Fund, of the value of $250, is assigned annually with the approval of the Faculty of the Museum, at the recommendation of the Professors of Zoölogy and of Comparative Anatomy in Harvard University, "in supporting or assisting to support one or more students who have shown decided talents in Zoölogy, and preferably in the direction of Marine Zoölogy."

The income of the Humboldt Fund (about $300) can be applied for the benefit of one or more students of Natural History, either at the Museum, the United States Fish Commission Station at Wood's Hole, or elsewhere.

Applications for the tables reserved for advanced students at the Wood's Hole Station should be made to the Faculty of the Museum before the 1st of May. Applicants should state their qualifications, and indicate the course of study they intend to pursue.

[C]

I WILL give to the President and Fellows of Harvard College for the use of the Museum of Comparative Zoölogy all the collections which I have at present deposited in the Museum, or which I may acquire hereafter, as well as such books as are not for the present reserved for my use, on the following terms. Hoping hereafter to devote my time to explorations and to the publication of the Reports of these explorations in the Bulletin and Memoirs of the Museum, I ask: —

1. That the assistants at the Museum Library supervise, as heretofore, the distribution of these publications both to societies and to individuals as I may direct.

2. That I be allowed to take from the exchanges for my use such books as I may select.

3. That the janitor and servants of the Museum continue to render to me such service as they were accustomed to give me while officially connected with the Museum.

4. That I be allowed to use the Museum Library, the greater part of which is my personal property, in the same manner as heretofore, and that such books as I may select and retain in my room be considered for the present my private property, subject to the same use as is now customary by the officers and students at the Museum.

5. That I be allowed to occupy the room where I now work to continue the preparation of the reports of the "Albatross" expedition, and of such expeditions as I may hereafter undertake.

6. That the Museum continue to pay the salary of my secretary, and that her services be at my disposal, as they have been in the past, either during my residence at Cambridge or at Newport, or during my absences from Cambridge.

7. That my artists be allowed to occupy the rooms they now use, or some other equally convenient place, to prepare the illustrations for the above mentioned Reports.

8. That I be allowed to continue the arrangement now existing between myself and Messrs. W. McM. Woodworth and A. G. Mayer, or their successors, by which they may devote such time as they do not give to the Museum to the interests of my explorations, either at the Museum or as Assistants during my explorations.

That any Assistants I may find it necessary to employ on the care of the collections made during my expeditions, or on the preparation of the material for publication, be assigned suitable quarters in the Museum building.

9. That I be allowed to store the outfit used on my expeditions in the basement of the Museum.

Upon receiving from the Corporation notice of their acceptance of the above conditions, I will execute a deed of gift covering the collections and books referred to in this letter.

I, ALEXANDER AGASSIZ of Cambridge, in consideration of one dollar and other good and valuable considerations to me paid by the President and Fellows of Harvard College, the receipt whereof is hereby acknowledged, do hereby give, grant, and convey to the said President and Fellows the following described articles of personal property now belonging to me and contained in or used in connection with the Museum of Comparative Zoölogy, viz.: —

Such collections as I have brought together on various expeditions to the West Indies, Central America, and in the Pacific.

The collections made by Mr. Garman and myself at Lake Titicaca.

The collection of Corals from the Great Barrier Reef of Australia, made by Prof. H. A. Ward.

The zoological collections purchased from Prof. Ward, the greater part of which are on exhibition in the Systematic and Faunal Rooms.

The osteological collections obtained from Messrs. Gerard and Ward, which are partly on exhibition and partly stored in the work-rooms.

My collections of Japanese Vertebrates and Invertebrates.

The collection of Casts and Models purchased from Messrs. Emerton, Damon Fritsch, Kappeler, Cope, from the Royal Museum at Brussels, and others.

The collection of Blaschka Models of Marine Invertebrates.

The Microscopes and other Laboratory apparatus which I have at varions times given to the Zoölogical and the Geological Departments.

The collections of Fossil Invertebrates, comprising the Day collection from the Niagara Limestone of Wisconsin, the Dyer collection of Invertebrates from Ohio, the Gebhard collection from Schoharie, the Taylor collection of Fossil Cephalopods, the Terrell collection of Fossil Fishes, the Walcott collection from the Trenton Limestone, as well as a number of smaller collections purchased from dealers in the United States.

The Shary collection of Silurian Fossils, the Haeberlein collection of Jurassic Fossils, and a small collection of Fossil Vertebrates obtained from Mr Rossignol.

The collections of Western Fossil Vertebrates made for me by Messrs. Garman, Sternberg, and others, as well as the collection of South American Fossil Edentates and the Fossils purchased from Prof. Ward.

All the copies remaining on hand of the volumes of the Bulletin (Vols. IV. to XXXII.) and of the Memoirs (Vols. III. to XXIII.) of the Museum which I printed for the use of the Museum. All the publications received in exchange for the Bulletins and Memoirs of the Museum, about 3,500 volumes, now in the Museum Library (except those specifically reserved and deposited in my work-room), and the books which I have purchased during the past twenty years, about 5,000 volumes.

To have and to hold the premises to the said President and Fellows of Harvard College, their successors and assigns, to their use forever.

Witness my hand and seal this thirty-first day of March, 1898.

(Signed) ALEXANDER AGASSIZ. (Seal.)

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Charlestown, MA 02129

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Annual report of the curator of the Tozzer Library ABU4462
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